Childhood Education

Using What We Know About Children In Teaching Arithmetic

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Childhood Education

For Those Concerned with Children

To Stimulate Thinking Rather Than Advocate Fixed Practice

CONTENTS FOR FEBRUARY 1950

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Next Month—

"Using What We Know About Children in Developing Science Learnings" is next month's theme.

Katherine Hill and Glenn Blough have contributed the editorials on "Understanding and Security" and "Science Changes Affecting Children."

Ralph Preston has prepared the article on the theme; Beatrice Hurley and Etheleen Daniel describe science experiences that contribute to children's development; Paul Blackwood describes science materials and equipment used by children in some of their science experiences; and Catherine Dillon discusses the use of radio in stimulating children to carry out science experiments.

News and reviews to keep you up to date.

REPRINTS — Orders for reprints from this issue must be received by the Graphic Arts Press, 914 20th Street, N. W., Washington 6, D. C., by the fifteenth of the month.

On Teaching Arithmetic

WHAT POINTS SHOULD BE EMPHASIZED in an issue of CHILDHOOD EDUCATION devoted to the subject, 'Using What We Know About Children in Teaching Arithmetic'?" This question was asked of Merle Gray, supervisor of elementary education, Hammond, Indiana, whose reply is quoted below.

"As I see it, Jennie Campbell stated or implied them in her editorial 'We Begin a New Year,' in the September 1949 issue. Here are four of the points she made and my interpretation in terms of the teaching of arithmetic":

I. *Each individual has his own inner growth potential.* Learning is an individual, personal matter. No two children learn in the same way or at the same rate. Since this is true, a child's progress should be measured in terms of his own learning pattern and his own maturity. He should not be compared with other children in the group. The goal should be his own growth—steady, day-to-day progress in understanding of and ability to use arithmetic in *realistic* situations closely related to his experiences.

No one can say at what age or in what year in school a child *must* learn specific topics or develop certain skills. Many opportunities at widely spaced periods of time should be provided for children to learn each topic. This enables them to take advantage of added maturity and partial learning.

As a child grows in maturity, he becomes capable of deeper undertanding and greater skill. Meanings, ideas, and concepts only partially grasped may later become entirely clear and begin to function for him.

II. *Any new learning is dependent upon the learner's past experience and is made up of the reorganization of meanings accumulated in the past and applied to the solution of the new problem.* Children vary widely in what they gain or retain from their experiences. For this reason, we cannot rely upon previous experiences alone to develop adequate foundations upon which to build understanding of arithmetic. We must supplement past experiences with experiences in school. If arithmetic is to be learned so that it will function as a useful tool, it must be presented in relation to the experiences of children.

It will be understood when it is *learned through experiences* that have significant meaning for children.

Skill with understanding must be developed if children are to use arithmetic for the solution of new problems as they arise in their daily experiences. Drill does not not make arithmetic meaningful. The function of drill is to provide the necessary practice in applying skills that have first been developed in realistic, meaningful situations.

The goal of all arithmetic teaching is the development of ability to solve problems. Therefore, the teaching should include guiding children in the solution of problems. Many of the problems should grow out of the children's experiences. An effort should be made to help them develop individual patterns of thinking about the problem situation.

III. *There is a logical sequence of organization of any field of learning that is the contribution of the culture.* The subject matter of arithmetic must be analyzed to determine the learning steps which the child must take in order to develop dependable facility in using that subject matter. These learning steps must be organized into a logical learning sequence which will enable children to learn with the greatest ease. The learning steps must then be presented at a time and in a way that take advantage of the children's maturity and the ways in which they learn.

Understanding and skill in arithmetic develop slowly and steadily over a long period of time, not in spurts of temporary achievement. All topics in arithmetic should be developed in their simplest, most concrete applications with one learning step leading to another over a long period of time, and with the relationship among the steps and the topics clearly pointed out and effectively emphasized.

IV. *It is the responsibility of the school, the home, and the community to provide the nurture necessary to foster growth. This can be done best through experiences that will satisfy children's urges. It is to the degree that they accept the experiences as satisfying solutions to their problems that learning has meaning for them and is woven into the fabric of usable ideas.* If we would have "arithmetic learning" woven into the fabric of usable ideas, these basic principles should guide our planning and teaching:

Children can and should enjoy arithmetic. They will enjoy it if they *understand* what they are doing every step of the way and if it is *presented* in a way and at the time when they *can succeed* in it.

Children should be conscious of steady progress and growth in the ability to use arithmetic.

Children should be helped to think for themselves and to take each learning step successfully.

Children should gain not only skill but skill with understanding. This will be the outcome if meanings precede manipulation throughout the development.

Children should develop a feeling of confidence and an awareness of their own individual progress.

CHILDREN SHOULD EXPERIENCE ARITHmetic as a constantly unfolding and expanding system of number relationships which are useful to them in their daily living.—MERLE GRAY, *elementary supervisor, public schools, Hammond, Indiana, and vice-president representing intermediate, ACEI.*

How to find out about children and how to use what we know about them in planning experiences in arithmetic with them are challengingly presented by May I. Young, supervisor in the Philadelphia public schools.

We Must First

IF WE COULD BUT GLIMPSE THE CHILD'S world as the child sees it, we would be at no loss to understand what should make up curriculum for him. Unfortunately, we cannot do this. The next best thing—and this we are learning to do better and better—is to look at the child in a great variety of situations and to study his reactions so that we will come to recognize his needs and his readinesses to meet these needs. From such a study will come many implications for the selection of situations which provide opportunity for children to experience; in short, for curriculum.

How and when shall we look at the child?

Hughes Mearns worked out a method years ago that is as effective today as it was then. He found that if he sat down near a group of youngsters and became intensely busy on some work of his own (many times it was "whittling" on a piece of wood), the children soon forgot his nearness and went on with their own activities. Hughes Mearns then became a silent observer and a recording machine for the children's ideas and language.

Perhaps whittling is beyond most of us. The important thing for us as teachers is that we broaden our viewpoint as to what constitutes observation of children. We have, perhaps, been overtrained to classroom and playground observation and to controlled test conditions. We need also to see that there is much that we can learn in out-of-school situations. As we walk in the neighborhood of the school or stop to speak to a parent (one ear on the group of youngsters playing nearby), or sit in an auto with windows open and with attention apparently on a book, we may observe the children in their real child-life activities without making them self-conscious.

We find that we learn not only many things about the children themselves but also much about the neighborhood of which they are a part, of the mores of the group into which they must fit and of its effect upon the language and ideas and emotions of the children. These two phases—the child and the environment—are best studied together rather than as isolates. For our purpose, they are part and parcel of the same picture. Fritz Redl constantly reminds us to keep our eye not on what is happening in the environment but rather upon what is happening within the individual because of his environment.

What Arithmetic Experiences Should Children Have at School?

What do we see when we look at the child that gives us clues to the arithmetic experiences he should be having in school?

The first thing that strikes us is the great number and variety of times that even very young children find necessity for using simple quantitative concepts. A two-year-old outside my window calls "It's my turn" and climbs up onto the swing. The four-year-old says "Push me in my wagon, Joey. I'll give you half my apple." The six-year-olds find they need two more wide boards to make the prow of the boat in which they are going to venture across the sea of grass.

Here in such homely situations we

By MAY I. YOUNG

Look at the Child

find our two- to six-year-olds using ideas of sequence and distance, fractions and power, measure and addition! They are building up a background of experiences which the teacher can ill afford to overlook when she is making plans for her class.

It would be such a simple matter if we could but use already compiled lists of activities in which children have engaged before coming to school. Of necessity, such a list is general rather than specific. It cannot take the place of the study which any particular teacher must make of her particular group. As a teacher, I am interested in knowing that sixty per cent of the children entering first grades in our large cities have gone with their mothers to grocery stores. My little group of thirty-five may be part of this sixty per cent (lucky me). Or they may be part of the other forty per cent (still lucky me, for I know immediately what I shall do about that). More likely, however, some of my group have had, and others have not had, the advantage of such an activity, and it is my job to find out what experiences the children in my particular group have had and what each child has gained from the experiences he has had.

Watching the responses of my group when we visit our neighborhood square, listening to their comments to each other on a walk to the nearby shopping center, noting their ideas when planning for an excursion—all these give me clues as to what they have gained from experiences which they have had.

In contrast to the play activities of the two- to six-year-olds noted above, let's look in on a group in another part of our town. The two-year-old is told by the five-year-old whose job it is to watch him and keep him out of trouble: "You sit over here, Billy. You're too little to get in the game with us fellows." The four-year-old runs to the itinerant ice wagon and calls "A 15c piece for 2204, second floor" and waits to grab the cooling chips in his little fist. The six-year-old is sent to the store around the corner for a can of soup and a loaf of bread and may even be trusted to bring back a bit of change.

These children, too, are having experiences with quantitative ideas, but quite different ones from those of the other group. On the surface, it might appear that this second group has more opportunities for building an arithmetic background. True, their experiences are very practical and, in many cases, quite adult in character. Does this mean that the teacher may assume a lessened responsibility in the arithmetic field? Decidedly not, for chances are that this group will need more help in some other phases of number, perhaps in sizes and distances, in economical use of time and space, in measurement.

Once again we see how important is the role of the teacher in studying her children. Not only must she make sure that their experiential background is large but she must analyze their individual backgrounds in order to find out just what experiences have been included so that she may know which ones to stress in her planning with the children for their activities.

Some Changes in Emphasis

What are some of the things the child should be learning? How and when should he be learning them?

For children in the lower grades especially, we have recently made changes in emphasis in teaching number which are of vital importance. First and foremost is the stress upon the building of concepts before we require the written form. This is no new idea: we have been working on it for years in the reading field. Before we introduce to the child the hen-tracks across the page which we have come to accept as words and sentences, we make sure that he has had many experiences through which he has built up a generous background of associations. Also, we see to it that during conversation periods in the classroom, he has opportunity for developing the vocabulary he needs to express his ideas.

Thus, before we introduce the printed word for dog, the children may have brought pets to school; they talk about their pets, describe their tricks, tell about feeding them. Perhaps they will draw them and have a bulletin-board pet show. Simple one sentence records under each picture may be the introduction of the printed word "dog". For example:

George has a little white dog.
Mary's dog can do tricks.
John's dog likes to play.

Now we see that exactly the same is true of arithmetic: ideas and concepts must precede the use of symbols. Reading and writing notation are not, as we had thought, ways of clarifying ideas. For many of our children, they are only added complexities. Did you ever have a child say "I can do it in my head. It's when I try to write it down that I have trouble with it"? Why should we insist on the written form for this child who at his particular stage of development works better without it? Do we haul out paper and pencil in a store when we spend $3.75 of a $5 bill and go through the laborious "borrow one from the five, makes it four, makes the zero ten" that we learned away back when?

Another change in emphasis has to do with the language of arithmetic. Most of us came through school with well-grounded definitions of terms such as fraction, decimal, addition. We now see the language of arithmetic much more broadly and more closely connected with daily living. Larger, many, first, longer, full, high, taller than, middle, another, by two's (or three's), and more are essentially arithmetic terms which the young child is learning to understand and to use as he engages in classroom activities such as watering the plants, choosing a paper for a drawing, dressing puppets for a show, building with blocks, putting windows and doors in a playhouse, locating materials in closets.

Teachers are becoming more and more aware of the necessity of presenting a variety of situations in which the children may use these terms. They know that a real concept must take into account the many different meanings that almost any word may take on, colored by the other words with which it is used. Witness the word "many," dictionary defined as "any large number." How many is "many" when a teacher says "We will need many apples for our party"? when a mother declares "I have so many children to take care of"? The same word but in one case it may mean thirty-five or forty, and in the other five or eight or ten. It is desirable for the children to recognize these variances in our use of words and to get the habit of broadening concepts—the habit which we call "learning."

The implications for curriculum building by each teacher for and with her group seem endless. The challenge

(Continued on page 278)

Number Experiences of Three-Year-Olds

By EILEEN CLARK

Eileen Clark, teacher of the three-year-olds, Dalton School, New York City, reports a brief study of young children's use of number and points out the implications of her findings for nursery school education.

THIS ARTICLE REPORTS A STUDY MADE of twelve children from two years nine months to three years ten months. Of the twelve children only two had attended school before. They were observed during the middle four weeks of a six-weeks session. The group met in the mornings only, the children going home at 12:30 p.m. immediately after lunch had been eaten.

These children came from middle class homes and varied considerably as to background and ability. The youngest children—two years nine months—were identical twin boys who talked almost continuously. One of the older children, a boy of three years ten months, only began to feel sufficiently at ease to talk spontaneously during the last three days of this study. Another older child, a girl of three years eight months, had only been talking for six months. Her vocabulary was extremely limited and her speech most indistinct.

The purpose of this study was to attempt to discover, limited by a short time and a small number of children, to what extent terms relating to number were used, to what extent these terms were used in a numerical sense, and how the nursery school stimulated and furthered this interest and comprehension.

The records of the children's remarks were made by the teachers while they worked with the children. On only one occasion was time—one and one-half hours—set aside for a teacher to record such remarks. So it is inevitable that many remarks went unheard and also that some which were heard were not recorded.

No attempt was made by the teachers to initiate a conversation involving the use of number terms or concepts. However, when an opportunity for such a conversation was offered by the child, the teacher took her opportunity. The recorded remarks are classified here under large general headings:

Counting

Sam (hammering nails): 1, 2, 4, 9 nails; 1, 2, 4, 9 nails.

Ray (jumping into pool): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10—jump!

Connie (playing with clay): I'm baking. This is bread. Look at all my breads.

Teacher: How many have you?

Connie: I have 1, 2, 3, 4.

Ray: I have 1, 2, 3, 4. (They each had 3.)

Mary (on a trip to the school garage): Cars, cars; lots of cars; 2, 8, 6, cars. (There were 3.)

Time

Gale: See my watch. Do you like my watch?

Teacher: What time does your watch say?

Gale: 30 after 7. (It said ten past eight.)

Ellen: I got a mosquito bite.

Teacher: That's too bad. Did you get it last night?

Ellen: No, not last night; this morning.

Teacher: Where were you?

Ellen: Getting my clothes on after my breakfast.

Sam (after getting washed for dinner): Now me want me supper. (And again seeing

dinner being brought into the room): Supper is coming.

Connie (on Edna's birthday): I'm going to have a birthday. My mother says I'm going to have a birthday.

Teacher: When is your birthday?

Connie: Soon.

Teacher: How old will you be on your birthday?

Connie: Nine. (She would be four.)

Opposites and Comparisons

Catherine: I don't like this big bicycle. I want the little one. (After trying it): I can't ride on that teeny bike.

Gale: I'm going to jump a long jump. 1, 2, 3, 4, 5, 6. Now I'm going to jump a short jump. 1, 2, 3.

Clara Belle: I go on the swing. Push me high. I go on the big swing. (She was on the swing which was highest from the ground.)

Ray (touching the graduated beads of a teacher's necklace): Little, little, little, little, little; big, big, big; little, little, little, little.

Mary: Big school bus.

Teacher: Would you like a ride?

Mary: No. Too big and too crowded.

Ray: I'm going to make a *big* bump.

Gale (jumping off a board): Here I come. 1, 2, 3. Here's a big jump. That was a high jump. I can jump way up to the sky.

Ray: Chickens, chickens. Do you want a chicken?

Teacher: Yes. How many may I have?

Ray: You can have this one. (Gave teacher biggest block out of his basket.)

Teacher: May I have a bigger one?

Ray (looking in his basket): That's big enough.

Teacher: Well could I have a smaller one as well as that one?

Ray: When you've eaten that one. (He went away and had a similar transaction with another teacher who said, "Now I'll pay you." Then he came back to first teacher and said. "Here, I need to pay you" and took his hand out of his pocket.)

Space

Mary: Look at me. I'm high—I'm way up high (standing on a table).

Sam (when placed on a table to be dressed): Me up high. Up high to the sky.

Teacher: Where is the sky?

Sam: High, high.

Sam (on jungle gym): Me way up high.

Joe: So me way up high.

Sam: Come to the swing. Up in the sky.

Joe: Push me up in the sky again.

Sam: Way up in the sky again.

Mary (on the jungle gym): I'm going up here.

Ray (on slide): I am going up a little way.

Mary: I am going down on my stomach.

Sam: Now I am going down on my back. Do you have a back? Do all teachers have backs? Yes (answering himself).

Joe (patting himself while naked): Me have tummy in front. Do you have tummy in front? Where's your tummy?

Clara Belle (when Michael tried to get in her box): No room.

Ray: Man came back again (as man on lawnmower re-passed the play yard).

Quantity

Sam (painting): Here's one. Here's another one.

Ray: I have a lot (playing with clay).

Sam: Me want more paint.

Joe: Me paint some more.

Joe (washing his hands at the sink): Me lot of water. Me want it full.

Ellen (at wash basin): Turn it off. Turn it off. It's enough.

Teacher: You can turn it this way. See?

Ellen (she did, and then looking at it): That's much.

Ray (taking all the bread on the plate): I can eat it all.

Joe (he and Sam being helped into jackets to go home): Now we both have jackets on.

Number Concept

Joe: Look, look, a fish.

Teacher: I see 1 fish. I see ——.

Joe: 2 fish (there were 2).

Mary: Would you like some milk?

Teacher: Yes, please. How much may I have?

Mary: You can have 2. (Handed over 1 block).

Sam (calling): Here, here you are. Here's some milk.

Teacher: Thank you. How much did you give me?

Sam: Three. (He had left imaginary milk).

Shape

Joe: Look me painting. Me painting. It's a circle. (It was).

Joe (picking up a triangular block): Look! Triangle.

Conclusions

Perhaps the most striking feature of this brief study is the variation in both use and comprehension of terms related to number. In a situation such as this, children who feel at ease most readily will tend to talk most and have the greatest number of recorded remarks. Although not strictly relevant, it is interesting that the twins—Joe and Sam—have the largest number of recorded remarks. How much did having the companionship of each other have to do with this?

It appears that number terms came in constantly in these young children's conversations, either with the teacher or with each other. The use was most often in relation to the child himself, e.g., Me want more. I'm up high. I'm going to jump a long jump. These particular children seemed to understand and use correctly the terms big, little, high, up, down, more, but were confused and uncertain about counting, time, their own age, and number concepts of 2 and 3.

Counting. These children seemed to know that a certain process is gone through in using some words and they do it, but more in the spirit of trying out the words than with any understanding of them. A three-year-old living in the same house with the writer was heard to say ein, zwie, drei, two, ten, as she came downstairs, and on another occasion, ein, zwei, ten, four, drei.

Time seems to be used correctly when it is within their comprehension. Ellen knew when she got her mosquito bite. But how could one explain to Sam that it was dinner not supper that he was going to have at school? He goes to sleep after each meal, gets up again after sleep, and goes to sleep in daylight both after dinner and supper.

Edna did not understand that it was her birthday even though her mother brought a cup cake and a crayon for each child which Edna handed around. Only one child spoke spontaneously about a birthday. When in a few cases a teacher asked certain children how old they were, they did not answer.

Number concepts tie up closely with counting in that the children seem to have no comprehension of the words two, three or four. The writer has seen a three-year-old day after day bring four brushes to put in four paint jars, but when she was asked how many brushes she had, the reply was "I have enough."

The contribution of the nursery school would seem to be that it gives children many opportunities to develop at their own speed. Through being with other children they converse, and by constant repetition of number terms, the meanings are clarified and made a real part of their understanding.

Materials are available which stimulate dramatic play involving numbers such as shopping baskets, dump trucks to fill and empty, engines to go places, doll families to provide for.

Stories are read, and while their prime purpose is to give pleasure and enjoyment they can only do this if they deal with subjects which are meaningful to the child. Thus, more repetition is given in the use of number terms and concepts. For example, *The Little Family* contains an account of a shopping expedition

which might clarify Ray's conception of who does the paying. *Bobbie and Donnie Were Twins* gives an excellent feeling of waiting a whole year before another birthday comes. *Davey's Day* gives a clear sequence of a child's day—what happens in the morning, the afternoon, in the night.

The children in nursery school become increasingly aware of birthdays and ages as one child after another has a birthday during the course of the school year. The children learn that they come to school in the morning and go home in the afternoon; that they stay at home on Saturday and Sunday.

The nursery school should also provide different sizes of the same materials to allow for comparisons, e.g., blocks, sandbox toys, doll beds, cars and trucks.

The provision of climbing places to experience being high, low, up, down, and underneath makes these terms much more meaningful.

Thus from this brief study it is seen that children of about three years of age use simple number terms in a conversational way very often without comprehension of their meaning, and that the nursery school can best stimulate and further this use and comprehension by providing a healthy environment in which children may grow and develop at their own speed.

ACEI Study Conference

Asheville, North Carolina, April 9-14, 1950

J. W. Byers Elia N. Edwards Clyde A. Erwin

J. W. Byers, *superintendent of schools:* The personnel of the Asheville city schools welcomes ACEI members and friends to the study conference. We are looking forward to it with contagious enthusiasm, confident that the conference will afford us many rich experiences which will be reflected in our future work.

Clyde A. Erwin, *state superintendent of public instruction:* The ACEI study conference will bring real inspiration to North Carolina in a period of our greatest educational development. The welfare of children is paramount in the minds of our people and we eagerly await the presence of great national leaders in education to point the way to new achievements for all of us.

Elia N. Edwards, *president, North Carolina* ACE: Association members in North Carolina are eager to share the beauty of our country, the talents of our people, and the educational achievements and aspirations of our state with all who attend the study conference. We are sure that the experiences of the conference will help us solve many problems and inspire us to increased professional interest, pride, and growth.

See the January 1950 issue of Childhood Education for registration and information forms or order from ACEI Headquarters.

Arithmetic at Work . . .

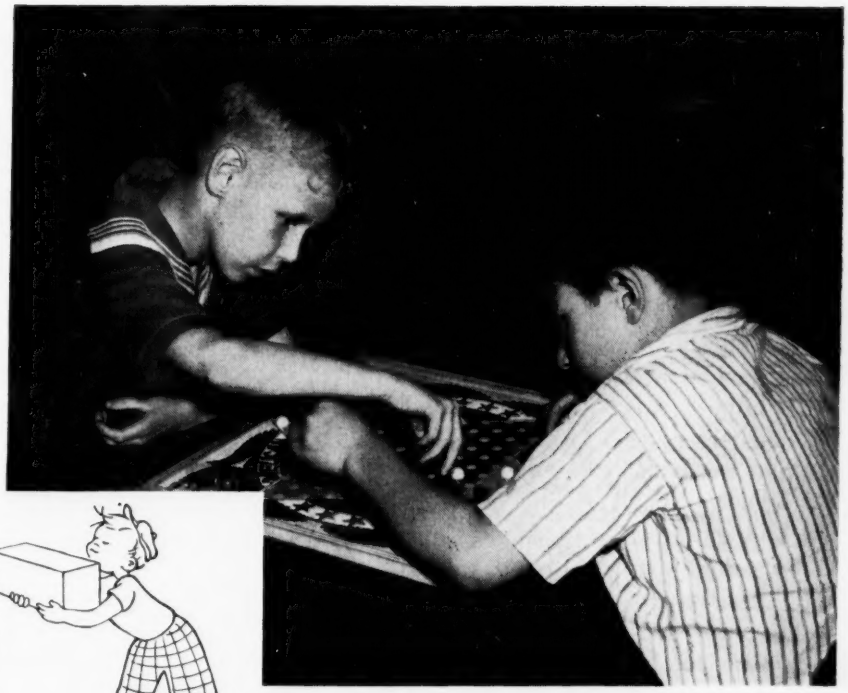

Photo by Eli Dorf for "The Toledo Blade"

. . . When the interest is real

. . . When the motivation is cooperative

. . . When facts are interpreted

. . . When daily living needs are served

By G. EDGAR COONS

When the Interest Is Real

How the housing shortage and a community pattern of home ownership stimulated eleven- and twelve-year-olds to a study of their community and the building of a model home is described by G. Edgar Coons, teacher in the Waynesboro, Pennsylvania, public schools.

STANLEY WAS A NEW STUDENT IN OUR school. His parents were former residents of the community but during the war they had been employed elsewhere. The father was now employed in Waynesboro and had brought his family back to his home town to live. Due to the housing shortage, it was necessary for them to move in with Stanley's grandparents until they could rent or build a suitable home.

The question of private ownership versus renting became a lively topic for discussion at school. Rents in various sections of the town were checked. The part that location and conveniences played and how supply and demand influenced rents were discussed. (Rent controls made this problem rather difficult.) Since a large percentage of our residents are home owners, the children naturally took the viewpoint that it would be better to own a home than to rent one. All angles of this problem were discussed and the children decided to build a model home as a school project.

Community Resources Are Used

It was soon evident that we needed more information so we invited into our classroom a real estate agent, a banker, a contractor, and an insurance representative. From the real estate agent the children found that the value of a property depended upon its location and state of repair. He explained the commission basis upon which his company worked.

The banker explained loans and mortgages. He told the class that private ownership was a step toward greater thrift. His invitation to visit the bank was readily accepted.

A contractor who was the father of one of the students did a splendid job of explaining how he goes about estimating the cost of building a home. Throughout the development of our project we visited homes under various stages of construction.

From the insurance representative the children learned how the rates are influenced by the location of the property and various types of building materials.

Committees Are Organized

The children organized various committees and each committee selected its own chairman who in turn was responsible for a report to the class as a whole on his committee's progress and intended activities. Every child had an opportunity to serve on one or more of the following committees:

The *planning* committee laid the ground work for the project and made all outside contacts necessary for its development.

The committee on *photography* was equipped with its own cameras and kept us supplied with photographs of various building activities as the project progressed.

The *construction* committee consisted of those pupils who had a desire for creative handcrafts. It grew by leaps and bounds. Every child had a desire to do some handwork.

The *evaluation* and *summary* committees were responsible for keeping records of progress and recording information gathered on interviews and field trips.

"Research" and Field Trips

When the making of a "model home" was decided upon as a fitting project, the children began to busy themselves selecting pictures of what in their opinion was a model home. Each choice was given due consideration and the classroom soon became a picture gallery of homes of all descriptions.

Then began the process of eliminating pictures and substituting ideas. As plans developed, it became necessary to get our ideas on paper; drawing to scale became a vital experience for every child. As floor plans developed problems of area, volume, and perimeter arose. These problems took on new meaning to the children and I'm sure they now understand what they were trying to do. They learned by doing. My teaching task was much easier because the children had an incentive.

Field trips became a common practice. We visited homes in all stages of construction and talked with contractors and laborers. After visiting all sections of the town, a final location was selected for our proposed home. A visit to the borough engineer's office resulted in the securing of a large blue print map of the town. We could now see graphically the location of our home in relation to schools and industries.

How to finance a home became an important problem. The planning committee kept a record of the questions asked and during our visit to the bank they were very ably answered by the man who conducted our tour. He was literally bombarded with questions for fully one hour. (So pleased was I with this reaction that as soon as possible I plan to have a recording made of the children's reactions to the visit.)

We Work With Interest and Understanding

Since our schoolroom is equipped with stationary desks, we removed one row to give us working space. This small area became a beehive of activity. The children were so interested in their undertaking that the head of the psychology department at a neighboring state teachers college asked to take pictures of them at work. They were very pleased that outsiders considered their project important. This is the work they did:

A group of boys decided to construct the house and garage. With the pride of skilled carpenters, they began their task. As the partitions and rafters were glued in place, critical eyes were ever on the alert. I know many dads were kept busy explaining the various techniques of construction. The result was a building of which we were all very proud. The boys received many favorable comments on their work.

The committee on garden construction was really alert. With modeling clay, twigs, dried grasses, mosses, and some artificial greens donated by an interested florist a unique garden soon made its appearance. Not only did miniature cabbage heads appear but also the lowly cabbage worm. By using some artificial greens for the tomato stalk and gluing small "red-hot" cinnamon candies to the vine, realistic tomatoes clung to staked vines in an orderly garden.

Dried grasses covered with poster paint became a patch of waving sweet corn. Dyed spagum moss represented rows of lettuce and spinach.

To the rear of the garden was a recreational area. Here a miniature pool and picnicking facilities were found. A few articles such as chairs, swings, and tables were made of plastics. The shrubbery was made and put in place after a conference with a landscape gardener who pointed out some do's and don'ts of planting. Realistic birch trees were made by painting weeds of a proper structure and height an off-white color, covering them

with glue, and then sprinkling them with sawdust dyed green. They were very realistic. Maple trees were made by dyeing sponges discarded by filling stations. (Various experiments were tried to secure a realistic effect. Cotton was covered with green powder paint and painted steel wool but the sponges turned out much better.)

Tiny weeds whose blooms had been long spent were painted with poster paint and became beautiful flowering shrubs and plants.

Pieces of celotex were painted green and used as a hedge around the property. Popsicle sticks cut to a proper length and painted white made a paling fence. To complete the work the children painted an appropriate backdrop to set it off.

Other Learnings and Projects

Throughout the development of this project fractions and decimals were used. As the need for some skill became apparent, it was taught. There was absolutely no special sequence of subject matter—one day we would be involved in the division of fractions, the next day we would jump to percentage when the budget problem arose. We learned how to (1) draw to scale; (2) compute areas, perimeters, volumes, and board measure; (3) compound denominate numbers; (4) compute simple interest; (5) estimate taxes necessary for the support of the schools; (6) make budgets; (7) market and buy at a discount, and (8) read the electric meter.

Several side projects came into being while our main project was being developed. When the problem of taxes arose, the support of the schools became a vital interest to all children. Using actual figures of assessed value and mill rate we estimated the taxes derived from various properties in the business district of our town. The children made plaster of Paris models of two city blocks and showed what each property owner had to pay in school taxes. They soon understood what raising the mill rate would mean to the property owner.

From the superintendent's office we secured information on tuition costs and how these figures were arrived at. The financial end of our education became a topic for discussion.

The little plaster of Paris models were a center of attention for some time. Several of the local merchants thought it a novel idea for the children to attempt to reproduce their places of business so accurately. On a chart accompanying the project the children showed by concrete example the amount of tax derived from each property which was designated by a letter, then the tax problem was solved. The chart bore a picture of Uncle Sam sheltering a boy and a girl and the slogan "Give our boys and girls good schools."

I feel that the undertaking has been very worthwhile. It was a pleasure to work when everyone was vitally interested in what was going on. Our model home is now on display and a new project —a community center—is in the making.

FOR NEARLY TEN YEARS WE AMERICANS HAVE BEEN LIVING LESS AND LESS courageously and creatively. . . . What the world needs is a renaissance of faith in the ability of the individual to determine his own destiny. . . . I am convinced that those of us who work with young children—both parents and teachers—have a profound obligation to resist the enervating and paralyzing effects of fear, uncertainty, and indecision. . . . PAUL MISNER, superintendent of schools, Glencoe, Illinois.

By FLORENCE WILKINS

When the Motivation Is Cooperative

Stimulated by their parents and teacher the second graders in Canyon Elementary School, Los Alamos, New Mexico, establish a bank and learn a lot of things. Florence Wilkins, their teacher, describes how and what happened, and suggests some safety measures.

I WISH THERE WERE A SCHOOL BANK FOR the children," said the mother of one of my second graders as we lingered over coffee after school one day.

Perhaps the fact that there was no bank in Los Alamos at that time made a school bank more desirable. Then, too, these mothers came from all over the country—there are no old residents in this atom bomb community. With them they have brought the ideas and experiences of different backgrounds. They are a friendly and informal group. Our monthly "teas" have the fun and sincerity of good over-the-back-fence neighbors. The coffee went around again while they talked of why they wanted their children to save, to develop money sense and thrift.

The children always ask about what happens at the teas with proprietary interest, and carry on the discussion their mothers have started. When they returned to school at noon that day they brought reports of what their daddies said, too. There were good ideas, but what struck me most was that from almost every parent came the earnest wish that their children learn to save money.

Yes, teacher knew all the time that she could sneak in some arithmetic—not what you would think at first, though, for the higher grades might develop skills from banking experiences for which second graders were not yet ready. But what most of my group lacked was any good reason for arithmetic. Didn't really matter whether you wrote 31 or 13: teacher knew what you meant even if she didn't let on. Money came and went easily without counting. When you wanted to go to the show mother or dad handed out more. Sometimes people gave you back change, sometimes not. Mother didn't use arithmetic when she went to the store, as far as they saw. A machine did it. The marble season wasn't on yet, the girls skipped to rhymes instead of counting, and nobody was very score-conscious in games. One little chip-off-the-old-block had it figured out anyway. His dad said that was why poker had it all over bridge—you didn't have to add up the score.

So banking came to a Canyon second grade. The overalled back in the photograph belongs to Billy. The stories below tell how each of the tellers, starting with Margaret and the file box, take care of Billy's banking.

Melvin's Story. We made bank books out of red paper. Then we made the inside of white paper. We had fun cutting paper.

Billy's Story. I deposit money every Tuesday. I have a bankbook. I bring it to school. I can fill out my own deposit slips. I take them to our bank.

Margaret's Story. I have a card index. We each have a card. It tells how much we bring each time. I gave Billy his card.

Bobby's Story. Billy gave me his bankbook and his card. I stamped them with the date.

Jeff's Story. Billy comes to me and gives me his money and deposit slip. I count his money and if it is right I pass it on to John.

John's Story. Billy brought his bankbook to me. He gave me his money and deposit slip.

Billy does his own banking *Photograph by Ellison*

And he gave me his card, too. I counted his money and wrote how much he brought in.

Penny's Story. I checked the bankbooks. I looked at the cards and the bankbooks. I was an auditor. The books and the cards were all right. Susann is in the picture. I was gone when they took the picture.

Priscilla's Story. Mary Ann and Karen and I count the money. We fix it to go to the bank.

How Much and What For?

How much did we save? About one hundred thirty-five dollars. We don't care particularly about the amount. Bobby bringing the nickel from his allowance every week; Susann struggling over whether to deposit her nickel or dime or to spend it at the third grade candy sale and triumphantly depositing it; father coming in to deposit Sonny's nickel because Sonny is sick and doesn't want to miss banking—these are the things that count. And the freckled bronco-buster who didn't see any reason for counting right and the blithe little girl who didn't care what she wrote—they tell the first graders how careful you have to be when you go to second grade and have a bank. They are careful, now.

What the children are saving for is sometimes surprising. I checked with the parents and found that some of the improbable tales were true, serious objectives; sometimes the child's individual desire; often his family's dream.

A second grader saving for a house doesn't seem so fantastic if you realize that Los Alamos is all government owned and, except for trailer residents, there are no home owners. Many who expect to stay here dream of a home of their own within driving distance. Construction workers who feel they may be here only two or three years plan for their homes when they go "back." "Our own home" or "our ranch" has great importance in family thinking in our community. Now, when so many children's interests are outside the family circle, the child who is saving every week for a family objective has his feet on stability.

Mary Anne: "I am saving for a house. My father and mother are too." (So were four others).

Robert J.: "I am saving money for a new Ford for my daddy and my mother and Pat."

Penny: "I am saving my money for a new room."

Paul: "I am saving for a Cub suit."

Jackie: "I am saving money to buy a German shepherd dog."

Gabriel: "I am saving money to buy a bicycle and a pair of roller skates. That is all I want."

One "Good" Produces Another

One of the good things about our bank was that the idea originated with the parents and has remained their project as well as the school's. These last years have brought a harmful and regrettable unsureness to parents. So much has been said and published about the special needs of children; about the need for psychologists and psychiatrists, special testing, trained social workers and such, that parents are often burdened with the fear of inadequacy in dealing with their children.

We have unintentionally done the same thing in schools—helped scare parents stiff of their own children. "I'd like to help Jimmy but I'm so afraid I'll do it wrong," is the sincere cry of many parents.

Any activity which brings parents and teachers into continuous mutual responsibility and pride, and makes families realize how much we need them in what we are trying to do for their children has invaluable dividends.

In our banking experience the mothers often realized for the first time that carrying money and keeping track of it until school time can be a real job for some seven-year-olds, and that the seventh birthday doesn't bring automatic realization that two nickels are worth a dime or have any value at all. However, I've never heard of a parent saying, "The school ought to teach them—" and you know that in second grade there are few things left unquoted! The parents just pitch in and help in developing the child's sense of money values. We both share anecdotes of these banking adventures with an understanding and zest that would never have been aroused by a report card saying "Immature in his number concepts."

The mothers' brainstorm has boomeranged, too. They are wondering about allowances, earning spending money, and just what those savings are for. One day I met three parents. Two said nearly the same thing: "You know I've been thinking; I wonder if it's right just to hand out money to Melvin to take to school. Should he have an allowance or should he earn part of his spending money?" The third said, "Do you think it would be all right to let Penny spend her bank money? Then she would really see how you can get the things you want if you save money for them."

These problems went round our coffee pot another day. Here are two of the mother's conclusions:

"I think the children should earn an allowance and not just be handed money whenever they think they need it. Ours have a weekly allowance and they must save a certain part of it. Bobby, the youngest, gets twenty-five cents a week drying dishes and keeping his toys put away. He must save at least five cents. Kenny, a little older, gets thirty cents a week for helping with the dishes and other little chores. He must save at least five cents. He also pays his Cub dues. Carol, the oldest, gets thirty-five cents. She helps quite a bit around the house. She must save at least ten cents. They may spend the rest but it must last the week. They all save more, and every one gave to the March of Dimes and Red Cross out of their spending money, without being told."

"Penny has great fun saving her money but she also has fun spending it. She may save

for a while then unwisely spend it for something she will tire of in a day or two. But "Bank Day" at school is a different plan for saving. Each week it is loads of fun to make out the deposit slip and to add savings recorded in her very own bankbook.

But for Penny we must also work out a plan for spending. After a little discussion she has decided to redecorate her room. She will not be required to save the entire amount necessary before she is permitted to spend. She may make withdrawals for curtains, pictures, lamps, and other items she may decide she needs, the less expensive coming first. I think that in this way it will not be just a hoarding project and will supply Penny's particular need. She will be learning to spend wisely as she learns to save."

Safety Measures

There are a few things I learned which might be useful to others. One of the most important is mistake-proofing the system. Though the children assume the responsibility and do the actual banking, a hawkeyed adult needs to see every bank entry as it is made. Any mistake would discredit the bank. That would not only embarrass the teacher; it would influence the child's attitude toward saving—"Put money in that old bank? Naw, they chiselled me out of a dime. Daddy says - - - -." As it is we have never heard anything but warm approval from the parents.

Mistake-proofing begins before the money leaves home. Each youngster takes a deposit slip to fill out at home. Our first teller counts the money and checks it with the deposit slip. If there is a discrepancy, the depositor searches his pockets again.

And there are discrepancies which defy pocket-searching. A note is made on the deposit slip which we keep, and word goes home. Mothers are generally understanding with the children about losses. They know that any difference between the money which went to school and what the bankbook says isn't because "one of the kids must have written it wrong." In fact, the children are so proud of the care with which their banking is done that they are more apt to assume responsibility for losing the money than to allow any doubt of the banker's infallibility!

Another safety measure is triplicate records. Deposit slips are filed by date. The deposit is entered on an index card under the depositor's name and in his bankbook. The index cards stay at school. The bankbook travels home for mother and daddy to see. Our deposit slips and cash are balanced.

Teacher has balled up her personal checking account often enough to know the hazards! Our bank accounts in second grade are models of accuracy and order. Anyone who conducts banking for thirty youngsters will find peace of mind only if those accounts have been planned, systematized, and checked. Even then she waits for the young auditors' report that the bankbook and cards all agree.

A Year-Round Project

School closes in June but our bank project does not. One of the highlights of the year was the day that the depositors went to our new community bank, each with a check for the amount of his savings. A member of the bank staff received them with enthusiasm and friendliness. She explained every step as each child endorsed his check and signed the papers necessary for opening his bank account. And oh the seriousness and importance with which each signature was made!

Each depositor emerged proudly with his bankbook. He and one parent have a joint savings account and it's hard to tell who is proudest—child, mother or daddy.

By SETH P. PHELPS

When Facts Are Interpreted

How twelve-year-olds found out that arithmetic is "something we can really use" is described by Seth Phelps, teacher in the Laboratory School, University of Chicago.

TOOLS—STRONG, SOLID, AND DURABLE—are made to be used and arithmetic is one of the tools necessary for effective, fuller living. Arithmetic is in the world about us! It is found in newspaper and magazine articles, in books and pamphlets if one will take the pains to look for it.

As a teacher the writer has sought ways and means to interest children in using arithmetic to learn more about the world in which they live. For example, news items with number concepts were selected by the children and teacher to be read and discussed. This article describes the pursuit of "lead on" interests which developed from the discussion of an article on the food rations and caloric content of the diets of people in certain areas of Europe.

Teacher and pupils compared their daily caloric intake with the calories contained in the daily diet of the undernourished peoples. A thoughtful girl said with considerable feeling, "We have lots of food in the United States. Why don't we send more of it to them?"

The teacher asked, "How much surplus food could the United States send to Europe? Could we feed all of those people? Would you like to learn more about our ability to produce food and other needed materials for less fortunate countries?"

They would! How could it be done? After some discussion it was agreed that each pupil would select from the following list an area of interest to himself: (1) soils; (2) water resources; (3) minerals; (4) wildlife; (5) forestry.

When each child had chosen his area of interest, the groups met and selected chairmen. Their first task was to search through a collection of magazines, booklets, textbooks, and reference books on conservation and to sort them for the use of the various committees. This collection was brought in by the teacher.

Articles in *The Saturday Evening Post*, *Collier's* and *Reader's Digest*, agricultural bulletins, conservation pamphlets, and the books *Our Plundered Planet*,[1] *Wildlife Conservation*,[2] and *Conservation in the United States*[3] were among the source materials gathered together by the teacher and the class.

The teacher suggested that the class review the technique of rounding off large numbers since many of the figures they would select for use would be large. Sample figures were selected and the approximate accuracy of rounded numbers was compared with the whole numbers. The class agreed that the rounded off numbers were quite accurate and said, "We can work with these numbers more easily than we could work with whole numbers."

We Compute the Figures

Next, the pupils set to work to gather figures which seemed important. They needed some help and asked the teacher to provide a sample for them. From

[1] By Fairfield Osborn. Boston: Little, Brown and Company, 1948.
[2] By Ira N. Gabrielson. New York: The Macmillan Company, 1941.
[3] By members of the faculty of Cornell University. Ithaca, New York: Comstock Publishing Company, Inc.

Osborn's *Our Plundered Planet*, the class found that the world population in 1940 was over two billion.[4] They also discovered that in the world there are from two and one-half to four billion acres of soil that can be plowed and are suitable for producing crops. Furthermore, two and one-half acres of land of average productivity are required to provide a minimum adequate diet for each person in the world.

The children then asked, "How many acres are there per person?" They readily divided 2.5 by 2, and 4 by 2 and said, "There are only from one and one-fourth to two acres of crop soil per person in the world."

"That isn't enough!" exclaimed several youngsters.

The teacher then pointed out that the population of the United States has grown from seventy-five million in 1900 to an estimated one hundred fifty million in 1950. He also asked the class, "How many acres of land that could produce food are there in the United States?"

These figures were obtained and the children calculated that in the past fifty years the arable soil in the United States has dropped from approximately 5.6 acres per person to about 2.8 acres per person. This with other suitable illustrations gave the children the impetus they needed. They collected their facts and figures and listed their sources of information. As these were turned in, the teacher checked them for accuracy against the references given. Some errors were found but there were surprisingly few.

A girl from one group said, "We've got so many numbers we don't know what to do with them."

"How about assembling them on duplicate sheets so that each committee member can have a set of them?" the teacher asked.

"A good idea but let's limit the figures to those in our major areas of interest," they replied.

[4] Ibid., page 39.

We Make Graphs

The children were ready for the next step. At the beginning they had suggested and agreed upon graphs as the best means of illustrating their work. Bar graphs, line graphs, pictographs, map graphs, and circle graphs were discussed and illustrated. Since, in this particular group, there was a range of more than three years in arithmetic abilities the circle graphs were not too difficult for the more able pupils and did challenge their ability.

The teacher also reviewed with the class how to use rulers, protractors, compasses; introduced the "T" square and triangle and demonstrated their uses. Lettering techniques were also considered. The children were more careful and their work was neater as a result. The class discussed the balance and centering of materials on a paper. The teacher made a few models and posted them, using other subjects so that he would not duplicate any work the pupils might do.

Graphs literally began to pour in to be checked for accuracy. "What are we going to do with this stuff?" asked one boy.

"We ought to show it to someone besides us," said another.

"How about making booklets of your materials?"

"Fine," the class responded eagerly.

"Would you like to duplicate your finished graphs so that each of you will have a copy for your booklet?"

By trial and error the children discovered that the best way to make a

good finished product was to make a rough draft and then draw over it on a master duplicating sheet before tracing the lines on a stencil.

The children, encouraged by the first completed graphs, worked with greater care, and the results were satisfying to them. They were now showing much interest in assembling the booklets. One boy who had previously disliked arithmetic greatly was chosen as a committee chairman and discovered, as he told his parents, a "new use for arithmetic."

Films As Resource Material

The film, "The River," was ordered for showing after the children agreed they would like to see it. It helped them to understand soil erosion and the part forests play in conserving water. One boy, on his own initiative, visited the school's visual aids center, selected some conservation films, previewed them, and asked his classmates if they would like to see them. He learned how to run the projector and showed the films to the class.

In the discussion which followed the showing of the films, one boy said, "They gave the same numbers for soil erosion I was using on my graph!"

A girl remarked, "Did you notice that it takes from 300 to 1,000 years for nature to make an inch of top soil?"

Another girl observed, "I see now how cutting down all the trees in the forests makes the soil wash away faster."

A general question was, "Are there more pictures we can see?"

Some new color films were available, the visual aids department ordered them, and they were enjoyed by the class. Other comments were:

"Did you see the comparison between soil with humus and without it? Soil with humus holds much more water."

"The film narrator said beavers were the first engineers to build dams and store water."

"Yes, and some kinds of fish have to be eaten by others or there will be so many of them they will starve to death."

"I never knew it took so much water to grow a pound of plant food."

"Gee! It helped me to understand my graph even better."

Discussions Help to Summarize Learnings

During the discussion period, the teacher asked whether they would like to make a bibliography to include in their booklets.

"That's a good idea," said one boy. "Then, if people don't believe us, they can look it up themselves.'"

The members of the class felt that it was fun to gather numbers from many sources for their arithmetic work.

"We learned different ways to use numbers."

"Graphs make things clear."

The group that worked on the committee studying minerals introduced the term "non-replenishable" to the class and explained its meaning. This group drew graphs which showed the tremendous drain war places on minerals.

One girl sent to Arizona for information and received some pamphlets. Excitedly she said, "Look, here's a copy of a bill on water rights. California wants water for people and Arizona wants it for crops. And it says here that Arizona has risen from tenth to fourth place in the production of citrus fruits!"

A final step, suggested by the teacher, was accepted by the class. With the cooperation of the whole group, the major ideas discovered by each group were discussed. Lists were made on the blackboard; copies were duplicated and returned to the committees. The committees used them as guides in writing sum-

mary paragraphs to be included in the booklets. The class agreed that this "sort of makes it a story."

"We ought to send copies to people and let them know about our natural resources."

General Understandings

Different children acted as chairmen during discussion groups which were held at the end of the conservation study. During these discussions the children compiled the following list of general understandings:

Soil: *1) A given amount of land can produce only a given amount of food. 2) Every person needs the food from a given amount of land in order to live. *3) There isn't enough crop land to support the people of the world. 4) We can slow down the washing away of our top soil if we act now. 5) We can return many materials to the soil and help maintain soil fertility.

Forests: 1) Forests help store water and prevent floods. 2) Forests furnish homes for wildlife. 3) Forests make humus and help build soil. 4) Forests keep soil from washing and blowing away. 5) Forests reduce drought and conserve rainfall. *6) We use forests faster than we replace them; by planting more trees than we cut we can increase the size of our forests.

Water: 1) Water is a good slave but a bad master. 2) All living things depend on water. *3) The force of water provides the power for generating electricity. 4) Water will become even more destructive unless we practice conservation. 5) Wildlife and fish are being killed by water pollution. 6) Much of our water is being polluted by city sewage. 7) Some large midwestern cities treat sewage and sell it for fertilizer. 8) Our water table is seriously low in several areas of the United States.

Fish and Wildlife: *1) Wildlife helps to keep the balance of nature. 2) Fishing and hunting provide recreation for many people. 3) Some forms of wildlife have become extinct because of lack of protective laws. 4) Fish from our coastal waters provide food and oils, but the supply of many kinds has been reduced while our needs have increased.

Minerals: 1) We now import oil from other countries. 2) Mechanization makes increasing drains on our nonreplenishable minerals. *3) War doubles the drain on our natural resources.

* Have mathematical concepts.

"Something We Can Use"

The work was finished. The booklets were assembled but the children still talked about conservation and brought in pictures. One boy who entered our school late in the year said, "I wish I could go back to my old school and tell them about conservation and how *we* use arithmetic."

That was last Spring. This Fall the children and even some of their parents stop by to talk about what we did. Their sustained interest has been surprising. Their zest and accuracy in completing the job were gratifying. While a considerable number of arithmetic periods were used for this project, it did broaden the children's awareness of the use of numbers in interpreting facts in the world about them.

It might be stressed at this point that the teacher played down the sensational "scare" philosophy which today surrounds the topic of food, and emphasized the fact that conservation is a way to learn more about the proper use and management of our natural resources so that more people can live better lives.

It is pertinent to note that the fundamental work with arithmetic was not neglected. As a matter-of-fact, arithmetic, the class agreed, was "Something we can really use!"

By RICHMOND PAGE

When Daily Living Needs Are Served

How arithmetic can become a part of today's vitally important process of learning to be effective citizens in a democracy is described by Richmond Page, editor, "Applied Economics," New York City.

TEN YEARS AGO THE PROJECT IN APPLIED Economics was started under a grant from the Alfred P. Sloan Foundation, Inc., at the Universities of Vermont, Kentucky, and Florida. More recently, the Project has been sponsored by the American Association of Colleges for Teacher Education with participating schools and teachers colleges scattered through the country from New England to Texas and from the Carolinas to the Dakotas.

The Project was founded on the idea that schools can and should adapt at least part of what they teach to the economic and daily living needs of the communities they serve. Children should learn early in school how to use the resources at hand in order to live better. In schools working with the Project, specific programs or units are carried out having such objectives as better diet and health, better and more beautiful places to live, better clothing, better recreation and cultural opportunities. Arithmetic, with the other primary skills, thus becomes one of the necessary tools in a program closely related to the actual needs of the children and their community.

It is sometimes thought that using language familiar to the child is sufficient to relate it to his life and needs, as with the following typical textbook problem:

> It takes 40 lb. hay, 110 lb. silage, 30 lb. grain and 200 lb. water to produce 100 lb. of milk. How many pounds of each did a champion Holstein cow need to produce 27,033 lb. of milk in a year?

While a rural child knows about cows, hay, silage and grain, the relation of this problem to his daily needs is actually rather remote unless he happens to own and help feed a champion Holstein cow —and we may safely assume such children are scarce.

A group of Negro schools in rural Georgia has worked out a set of problems much better fitted to the needs and lives of their children. Here is one about whether it would be better to sell grain or feed it to the hogs:

> It requires about 6 lb. of grain to produce 1 lb. of pork (liveweight).
>
> a. About how many pounds of grain would be required to produce a 250 lb. hog?
>
> b. At the present price of grain, what would this amount be worth?
>
> c. At the present price of hogs per pound (liveweight), what would a 250 lb. hog be worth?
>
> d. Which is the greater, the value of the grain required to produce the hog or the value of the hog?

Since the families of the children in these schools customarily keep a hog, this problem is not only an exercise in arithmetic but provides valuable information at the point where it is needed. It tells them whether or not they should keep their hog.

Toward a Common Objective . . .

At schools participating in the Project in Applied Economics a further step is made in that arithmetic takes its natural

place as a tool alongside the other two R's in real life situations sometimes simple, sometimes complex, depending usually on the grade level. These situations also involve such educational necessities as cooperatively working together toward a common objective, the living experience of democratic procedures and personality development.

A rather simple example comes from a midwestern elementary school. The officially ordained time had arrived for learning the addition of fractions. But the teacher did not immediately rush to chalk these abstractions on the board. During the nutrition lessons the children were showing interest in the way plants grow, the different kinds of vegetables and how they contribute to bodily health and growth. One day they decided they would like to build a cold-frame in the yard to grow some of the vegetables they had been talking about.

The teacher seized the opportunity. "All right," she said, "let's go out and see where we can put it." They chose a good sheltered place with plenty of sun and then a lot of questions came up. They would need lumber, glass, fertilizer, but how much of each and what would be the cost? What could they save if they could find people to donate some of the materials? How much space should they allot each of the different vegetables? The cold-frame, when they began to consider the details of building it, seemed more complicated than they had thought.

"I think," the teacher said, "we had better learn some arithmetic and find out." So back they went inside and the teacher chalked up her fractions—but they were not just abstract figures. They were the board feet of lumber, pounds of fertilizer, squares of glass, dollars and cents that were to build their own cold-frame. Finding common denominators became part of their cold-frame project and arithmetic, they discovered, was working for them instead of their working for arithmetic.

A program which had a deep influence on the lives of the children concerns a new teacher who came to teach the fifth, sixth, seventh, and eighth grades in a two-room school, which had a reputation for delinquency, on the outskirts of a New Hampshire city. Her predecessor had taught by rote, ruler, and rage, the suppression of the children being about equal to the expression of the teacher. Patient and skillful as the new teacher was it took a long time and many discouragements for her even to begin to gain the confidence of the children. Several frankly announced they were there only because they were forced to be and would most certainly depart at the first legal moment. Meanwhile they would just sit.

It was not until March that a break came which permitted the teacher really to teach. Superficially it was a simple thing but underneath it had all the half understood complexities of a fundamental change in group behavior. The professor of biology at nearby Keene Teachers College came (why don't teachers college professors visit schools more often?) and told the children about tent caterpillars, describing their habits and the damage they do. He ended by suggesting that if the children and the teacher liked the idea it might be a good thing to put on a campaign to eradicate them.

The children immediately kindled to the suggestion and although the teacher realized a good part of their interest came from the prospect of getting out of the schoolroom a few hours each week, she thankfully recognized that it might

be the very motivation she had been vainly seeking so long, upon which she could build. And so it turned out.

In this project the children used arithmetic for drawing scale maps of the neighborhood, making shelves for exhibits, estimating the number of caterpillars in different sizes of nests, computing the weekly, monthly, and total number exterminated which eventually reached into the millions. Enough different aptitudes were called for so that each child felt that he or she was contributing something special in addition to their rather spectacular group accomplishment which was warmly approved by the community.

Since then other projects have been undertaken such as vegetable and flower gardens, landscaping and earning money for a piano—all of them requiring the use of arithmetic and other skills to gain an objective they themselves wanted. During the years the atmosphere of this school has changed from hostility to friendliness and from frustration to satisfaction. For the parents as well as the children it would be hard to overestimate the value of this approach to education.

The fifth and sixth graders of several schools participating in the Project have started food stores (in at least one case after voting to discard the soft drink vending machine) which call for a combination of nutrition, reading, writing, arithmetic and working together. This gives rise to such practical arithmetic problems as the following:

> The members of the arrangement committee had to fill 67 orders of potato chips. One member of the committee counted the potato chips in a 69 cent bag and a 25 cent bag. There were 670 potato chips in the two bags. How many potato chips should the committee allow for each order? If each order is sold for 2 cents, what will be the income for all the orders? If the committee sold all the orders, did the committee make or lose money ? How much?

These youngsters know from their own experience what arithmetic is for, because it is an essential part of their business.

At an older age level, the senior class of the high school in a small Texas town gives a good example of how participants in the Project learn and use arithmetic along with other skills, in attaining an objective which is affecting the whole community. In its applied economics period the class was discussing the fact that a great many of the young people were leaving town as soon as they could. A good part of the reason seemed to be the town's total lack of recreational facilities outside the home. The class agreed on the need for a recreational area open to all which would include baseball and football fields; tennis courts; play space with equipment for young children; a community building for dances, movies, and social gatherings and, in the hope of the more optimistic, an indoor swimming pool.

They decided to draw up a plan and try to sell it to the community. In the class periods available to them for the purpose, and working after school hours, the class located and measured possible parcels of land and made a tentative list of requirements. It was then necessary to estimate costs with reference to the maximum tax that could be levied, the interest on a bond issue, possible loans from banks. When costs and potential resources were balanced to arrive at what might be possible, a detailed and accurate blueprint was made requiring the use of geometry as well as arithmetic, and statistics were worked out to support their arguments. The class then appointed committees to present their plan to the local service clubs,

the women's club, the Grange, and the American Legion.

This project is not yet complete but the class has aroused powerful community support, including that of the mayor, and it seems certain they will get at least the essentials of what they are after. Meanwhile they are learning to apply their school-acquired skills, including arithmetic, to needs which are not only important to them but which will have a lasting influence on the development of their community.

Scores of other projects are in operation in rural, town, and city schools such as city and town housing surveys, vermin extermination and clean-up campaigns, school lunchrooms, the landscaping and improvement of school grounds, experimental school gardens, diet and health programs, and many others. All of them are fitted to the particular needs of the children who carry them out and nearly all of them put arithmetic to work in exactly the same way it will some day work for them in adult life.

. . . *Effective Citizens in a Democracy*

Using arithmetic as a working tool does not, of course, do away with the necessity for drill and practice. Tables must be learned by heart and methods and techniques must come as close as possible to second nature, if arithmetic is to be a servant rather than a master. But when the children can clearly see, at their own level of comprehension, that arithmetic is a necessity to their purposes, then the drills and practice are emotionally as well as intellectually understood and learning becomes a lot easier and quicker.

As indicated in the beginning the Project in Applied Economics is not primarily intended to teach arithmetic or any other subject. Its purpose is to use good educational methods in raising community living standards through the schools. In this setting arithmetic becomes a part of a specific process or program toward a goal understood and desired by children, teachers, and community. And because experience has shown these programs cannot successfully be carried out unless they *are* understood and desired, and because they are always carried out through cooperation and mutual consent, they in turn become a part of today's vitally important process of learning to be effective citizens in a democracy.

Birthdays--Gradual

Contributed by RUTH CORNELIUS

LAWRENCE (WHO DOROTHY OBSERVES IS NOT MUCH BOY—MOSTLY puppy) had his sixth birthday last Wednesday. He enjoyed his sixness very much. The kids made cards for him and suggested him to do the special honors for the day like choosing stories and songs and giving out paper—all because of his birthday. On Thursday Lawrence asked a special favor because "it is my birthday."

"Your birthday was yesterday," reminded his time-conscious teacher.

"Still goin' on," said Lawrence in his hoarse voice.

"Today, too? Why it was yesterday," replied his teacher.

"I have my birthdays grad—," he stumbled and fumbled for the word.

"Gradually?" I asked.

Pleased that an adult creature had finally caught on Lawrence said, "Yep! Have my birthdays gradual. Still goin' on."

By E. T. McSWAIN

Discovering Meanings in Arithmetic

"Quantitative communication is as important in modern society for meaningful living as expressive and receptive communication," says E. T. McSwain, professor of education at Northwestern University. He discusses why and points out how each child can be helped to create his own psychological arithmetic.

ARITHMETIC IS AN IMPORTANT LANGUAGE in community living. It enables the individual to interpret and to communicate ideas of quantity and the relationship of quantities. Our arithmetical language involves more than the ability to do rote counting, to read abstract figures, and to do mechanical computation. The substance of arithmetic is psychological in meaning and application. The pupil's understanding of the meaning and function of quantitative communication in community life is influenced by the instructional methods and materials experienced in the classroom.

The typical method of instruction directs the attention of pupils to the authority of the teacher, the textbook, and the workbook. Various means are applied to motivate learning the concepts explained by the teacher such as the fundamental combination facts and abstract computation. Emphasis is placed on memory and drill. Pupil progress is appraised primarily by the ability to work with speed and accuracy, the examples given from the textbook, in the workbook or on the blackboard. The focus of instruction is on memory and drill.

The major purpose in teaching arithmetic is to help pupils to discover arithmetical meanings and to develop ability to do quantitative thinking. Classroom situations and materials should be selected to motivate questions about quantity and the relationship of quantities. The teacher's role is to stimulate the search for meanings that underlie counting, the decimal number system, the operational processes, and problem-solving involving quantity. The teacher should strive to help each pupil create for himself a psychological understanding of arithmetic that will insure adequacy and interest in using quantitative language as a means to solve many personal needs and to cope intelligently with quantitative problems encountered in home and community living.

It is reasonable to assume that the elementary school should provide experiences, material, and guidance that will motivate pupils to discover and to understand the basic concepts of arithmetic such as the quantitative meaning and function of the figures 1 to 9, the decimal value of base positions—1, 10, 100—counting, grouping of quantities, and the four fundamental operations. Pupils show interest and pleasure in learning about arithmetic when the teacher employs methods that stress the discovery of meanings and when the curriculum includes much concrete material and related-to-life situations. Difficulties in learning arithmetic occur when too much emphasis is given to speed and abstract computation.

Meaningful progress in discovering arithmetical ideas and in developing the ability to do quantitative thinking is

dependent upon directed study of the meaning and use of arithmetic. Each instructional period can be a most interesting and productive experience in creative learning. The teacher may present specific questions that motivate pupils to experiment with concrete objects to find new ideas. They may challenge each other to prove the validity of the arithmetical experiments. The pupils should be encouraged to utilize every opportunity to apply what has been learned in arithmetic to other situations encountered both in and out of school.

Each operational process in arithmetic can best be learned by progressing from the concrete to the abstract application. The personal and social application, however, is restricted to quality of the psychological interpretation that the pupil has created from his classroom work. Addition, for example, is a psychological process to determine the answer to certain types of quantitative questions. It is a thought process that enables a person to find the amount of two or more given quantities when they are grouped as one quantity. Definite guidance is needed in making the transition from the regrouping of concrete objects into a single group to adding figures in an example that represents ideas of concrete quantity. Meaningful addition requires the pupil to create a mental picture of what has happened when two or more quantities are regrouped as a sum or single group.

Accuracy and Adequacy in Addition

Adequacy and accuracy in addition call for definite meanings such as the basic additive combinations, transformation, base positional value, and the function of addends. Each concept can be learned more effectively by experimenting with concrete objects. The teacher, for example, may give the pupils six packets of cards containing seven cards each. The pupils are asked to take one packet and count the cards. They then are asked to change the cards into two groups in which four cards are in one group and three cards are in another group. The pupils discover that one group of seven cards can be regrouped into two groups of four and three cards each. One additive fact has been discovered.

In a similar way, the pupils can discover the six combinations of two groups of quantity when changed into one group to give the sum or total of seven. Directed experimentation with objects will enable the pupils to discover with quantitative meaning the 81 fundamental combinations needed in computing the sum to any example in addition. Meaningful application (practice) will be needed to develop skill in using the discovered meanings. The psychological content that is learned is basically different from that obtained from flash cards and abstract drill.

The meaning of transformation must be understood before pupils are expected to find the sum to examples where the sum of the addends in any one base position is ten or more. The largest combination of any two addends into one group is $9 + 9$. By using concrete objects the pupils can readily understand that when 9 cards and 9 cards are grouped into one group the sum is 18 cards. However, before writing a number to represent the single group of 18 cards, the pupils must group 10 cards and think of the 10 cards as one unit. The figure 1 in the 10's base stands for 1 unit of 10 cards, the figure 8 in the 1's base stands for 8 single cards. In transformation, the pupils do not carry

1 card from the 1's column to the 10's column. They write the figure 1 in the 10's column to stand for the 10 cards that have been grouped as a single unit and is now recorded in the column that has a base value of 10 in our decimal number system. The process of transformation (not carrying) can be learned with meaning when pupils are given the opportunity to work with concrete objects and then to make meaningful transition to written examples. Meanings are essential in quantitative thinking. Pupils who make errors in addition need re-teaching experiences rather than abstract drill.

When Using Subtraction

Many pupils appear to be confused and to make errors when using subtraction. The difficulties are not inherent in subtraction. They have their origin in the faulty psychological process that pupils have learned. Subtraction is a process in thinking to find the answer to two types of quantitative situations. One type involves only one quantity. The question asked is, "How much is left when a certain amount of the quantity has been removed?" This is the so-called take-away idea of subtraction.

The second idea of subtraction is a mental process to answer the question, "What is the comparison or difference between two given quantities?" It is incorrect to attempt to use the take-away idea of subtraction to find the answer to the second question. The process of finding the difference—the additive idea of subtraction—must be used when two quantities are given. All subtraction examples given in the textbook present the question, "What is the difference between two quantities." It is reasonable, therefore, that pupils be taught to use the additive method in finding the answer or difference.

Assume that the pupils are given the quantitative question, "What is the difference between 36 inches and 24 inches?" Two quantities are given. If we remove 24 inches from 36 inches, we shall have 12 inches left in one quantity and 24 inches in the other given quantity. Pupils should be given meaningful experience that enables them to recognize that they must find the difference between the two quantities. This can be done easily by finding the difference between the addends in each base position. The difference between 4 inches and 6 inches is 2 inches and the difference between 2 units of 10 inches each and 3 units of 10 inches each is 1 unit of 10 inches. The difference is, therefore, 12 inches.

Pupils may be confused when asked to find the answer to a subtraction example in which an addend in any one of the base positions in the subtrahend (smaller quantity) is less than the addend in the corresponding base position in the minuend, (the larger quantity). Where pupils have learned the meaning and use of transformation in addition, they need not experience this difficulty. By using concrete objects they discover readily the ability to take one unit from the next higher base and transform it into 10 units of the given base in which more units are needed in order to find the difference between the addend in a specific base in the minuend and the addend given in the same base position in the subtrahend. Pupils who are taught to borrow one from the figure to the left in the minuend have difficulty in understanding the correct meaning of transformation. Quantitative thinking should precede computation. Frequently pupils

should be challenged to prove the validity of the answer. Pupils who are unable to prove the result of a subtraction example do not possess a meaningful interpretation of the quantitative question or the process that was used to arrive at the answer or the difference between two given quantities.

Addition and subtraction are psychoarithmetical processes to determine the answer to specific situations in which concrete quantities or ideas of quantities are involved. Their social value will be discovered as teachers assist pupils to discuss the use of what has been learned in arithmetic in finding answers to quantitative questions presented in other curriculum subjects such as science, social studies, and the arts. Many school experiences such as keeping a record of class attendance, preparing the lunch order, making plans for trips and parties, and operating a school store provide opportunity to show the social use of the quantitative language. Pupils may be asked to make a survey of the community to find out how addition and subtraction are used in the home, in business, in sports, and in industry.

Meaningful Understanding of Multiplication

Children do not have difficulty in learning topics that are meaningful. When appropriate guidance and discovery situations are given, pupils can gain a meaningful understanding of elementary multiplication. When the multiplier is under ten, then the pupils make a meaningful transition from addition. The concept that multiplication is a short method to find the sum of equal size quantities can be readily discovered. It is important that pupils recognize the multiplicand to be only one of the equal size groups, (the addend), and that the multiplier tell how many equal size groups are to be grouped into one group or the product. The multiplication sign (x) helps to ask the question, "What will be the product or sum of a given number of equal size groups when they are combined into one group?" Pupils need much experience in working with concrete groups before they are asked to find the answer to written examples. Helpful to pupils is the request to read the meaning of the question that is asked before using the multiplication process to determine the answer to the given question.

The teacher should plan activities that give pupils the opportunity to discover the multiplication facts or combinations. Memorized combinations do not contribute to quantitative thinking. The teacher, for example, may give pupils eight objects. They then are asked to arrange the objects into groups of two or four each. The combinations 2 x 4 objects and 4 x 2 objects are discovered easily. In a similar manner the pupils can discover all of the 81 multiplicative facts. Interesting classroom activities may be used for developing adequacy and accuracy in using these combinations to answer questions that require the use of multiplication as a short cut in quantitative thinking.

The Eighty-one Divisional Facts

Division is a source of difficulty for many pupils and some teachers. There is no psychological reason why pupils cannot learn the meaning of simple division in the primary grades. Division is more than an abstract process of "zinto." It is a psychological method to answer two types of questions about quantity or quantities. When we wish to change a given quantity into equal units of quantity we use the dividing or distributing

idea. When we wish to find the ratio between two quantities we are required to use the comparison interpretation of division. The work in division in the primary grades should be limited to the 81 divisional facts. These can be readily discovered and understood when pupils have encouragement and time to work with concrete materials. Emphasis should be given to identifying the question and to working with concrete materials to determine the answer. It is advisable to require pupils at times to read the meaning of their computation and to give the proof of their answer to the quantitative question.

Quantitative Communication Is Important

Haste in abstract teaching is a barrier to creative learning. Teachers in the primary grades should provide time and concrete material to aid pupils in discovering the foundational concepts in arithmetic. More emphasis should be given to experimentation, reasoning, and proof than to rote memory and abstract computation.

The curriculum in arithmetic in the primary grades should be carefully planned. During these years the pupils are acquiring meanings, interests, and attitudes that condition their understanding and use of quantitative language in the intermediate grades. The writer has been impressed with the progress that pupils in the primary grades can make in quantitative thinking when the classroom environment and teacher guidance motivate the learning of meanings through experimentation with concrete materials.

Of equal importance is the teacher's interpretation of the arithmetical meanings that society expects the school to help pupils to discover and to understand. Each child creates his own psychological arithmetic. The classroom methods, experiences, and materials condition how he learns, what he learns, and how he will use what has been learned in out-of-school living. Quantitative communication is as important in modern society for meaningful living as expressive and receptive communication.

Balloons I've Seen

By WILLOW BROWN

Balloons blown round and puffed out wide,
Balloons blown long and thin at the sides,
Balloons all wrung like a rag to dry,
And hung in the breeze on a stick to fly.
Balloons with arms and legs and feet,
Balloons that sail above the street
Balloons of red, balloons of blue,
Balloons of green and yellow too.
But just a prick of one small pin,
Or an extra puff in one too thin,
Makes any balloon I've ever seen,
Play me a trick that's oh so mean.

Re-Orienting

From a succinct statement of what is meant by arithmetic to an analysis of the kinds of experiences important in developing problem-solving ability Mrs. Beatty, elementary co-ordinator, San Diego, California, surveys briefly research studies in child development and in the teaching of arithmetic.

Do children use arithmetic in their lives outside of school?

How can I help the children see that arithmetic is useful to them?

Why it is necessary each year to re-teach what the children had last year?

Should I use more drill?

Why are so many children confused by arithmetic problems?

These questions indicate a very real concern with the problem of teaching arithmetic in such a way that it will function effectively in the lives of children. In seeking answers to them, many of us are turning to research in child development and in the teaching of arithmetic. As we read the studies we find ourselves re-orienting to the problem.

Arithmetic Is Both Quantitative Ideas and Process of Thought

Before turning to the studies, it is important to consider just what is meant by *arithmetic*. Arithmetic is a way of understanding and meeting situations which occur in life. It is commonly accepted today that the content of arithmetic is more than number. Weight, capacity, distance, form, temperature, money and time are some of the organized areas of knowledge which, with number, make up the content of arithmetic.

Arithmetic is also more than these quantitative concepts. It is both ideas of quantity *and* process of thinking. Growth in ability to think and growth in concepts are like warp and woof; if either is omitted there is no cloth when the weaving is done. Our task as teachers is to arrange a rich environment, within the limits of children's interests and abilities, in ways to stimulate widespread experiences with both the concepts of arithmetic and the processes of problem solving.

Arithmetic Is Important in the Lives of Children

Early in their lives children give evidence of arithmetical behavior. These ways of behaving mature gradually over a long period of time. The infant reaches for *more*, raises his arms to be lifted *up*, wriggles to be set *down*. The toddler gauges *distance* and *location* in avoiding bumps and bruises. He works with *shape* and *size* as he manipulates and plays. He *collects* things into *groups;* he *separates* things from collections. He protests vociferously when something is taken from a collection which he prizes. Through such experiences he develops meanings for the words used by the people around him. At about eighteen months he says "up", "down", "more", "all gone"—words which meet his needs. (21).

After a time the language of crude quantitative comparison is not sufficient for a child's needs. He must turn to the measures and number for clearer communication of ideas. He asks for "another"; says "give me two." (21, 47) He wants to know *where? when? what shape? how big? how many? which one?* He uses arithmetic in thinking about his environment, in communicating regarding it, and in solving problems arising in it. (53) These uses persist throughout his life.

By LESLIE BEATTY

to the Teaching of Arithmetic

At times a child's questions are answered, or his problems solved, through direct perceptual information. At other times, symbols of ideas are required. Children *can* learn to use number symbols and the structure of number language as readily as word symbols and sentence structure. In each instance a transition must be made from perceptual experience to the use of abstract ideas. Just as children learn words which stand for objects—*dog, car, ball* or events—*party, trip, ride*—so they learn the language of comparison—*more, big, long.* Just as they learn word symbols, so they learn number symbols. Just as they learn to read and write words in sentences—*The ball is round;* so they learn to read and write numbers in statements —2+3=5. Experience precedes the symbols; both are necessary to growth in power to use arithmetic intelligently in daily living.

The Point of Transition From Experience to Symbol Is Crucial

The transition from experience to the meaningful use of abstract symbols is a crucial point in the learning of arithmetic as it is, indeed, in most learning. We often fail to supply the bridges which lead children from concrete experiences to generalized ideas which involve operation with symbols. For example, the six- and seven-year-olds understand dividend-divisor-quotient relations at the concrete level. They know that if a given number of cookies are to be shared equally by a group of people, the number per person decreases as the number of people increases. (3) Yet the older children experience much difficulty in division with common and decimal fractions. They may have failed to generalize the principles which are common to the situations. They may not see the relation between the ideas and the abstract symbolization.

No studies make clear just *how* the change from concrete perceptual response to abstract symbolic behavior occurs. However, the evidence does indicate that children must generalize from many concrete experiences the relations represented by abstract symbols. (6, 9, 41, 48, 54, 66) The too frequent necessity for reteaching arithmetic which children "had" the year before may stem either from lack of suitable experiences or from failure to make the transition from experience to symbol. In either case the children did not really "have" the arithmetic in the sense of making it a part of the structure of their thinking.

Early, Less Mature Responses Are Important to Development of Later Understanding and Skill

There is clear evidence in research that learning arithmetic is a developmental process in which growth is made toward more mature ways of thought. (6, 10, 11, 12, 13, 35, 37, 46, 47, 51, 53) Since a child's less mature ways emerge into his more mature ways of thinking, his earlier responses are indispensable to the development of later understanding and skill.

Long ways of working, which seem inefficient and even confusing to an

Editor's Note: The numbers in parentheses refer to research studies listed in the bibliography on pages 276-278.

adult, may serve to clarify ideas for children. Stern has analyzed basic number ideas and describes experiences which stimulate children's understanding of number relations at the pre-symbolic level. (54) Nicholson has shown the effectiveness of always having concrete objects available to children as they learn the number combinations. (43) Brownell has demonstrated that the use of a "crutch" in subtraction is helpful to children and is easily discarded when no longer needed. (7) Spencer has found that the long method of multiplying by one-figure multipliers aids children's understanding of the process. (31) Grossnickle presents evidence that long division with a one-digit divisor is more readily understood than short division. (22)

Effective Practice Demands Understanding

It is a truism that children learn what they practice. Therefore, as teachers we must be alert to just what children are practicing. Is John learning that the last number he says as he counts tells how many blocks he has, or is he merely repeating a list of names as he points to each one? Is Mary describing group relations as she writes 2+3=5, or is she copying an interesting pattern? Does Dick know why he brings down the next number in long division, or is he just following the form he sees before him in a book? Can Sue recognize a piece of ribbon as being about a yard long, or does she simply parrot the statement "3 feet equal 1 yard"? Is Bill learning the usefulness of arithmetic in solving his problems, or is he learning ways of avoiding a frustrating experience?

That practice is effective which gives children ample opportunity to understand what they are doing. Self-discovery of all combinations in the four processes through grouping and re-grouping of concrete objects (43, 66), learning addition and subtraction facts through discovery of generalizations, (37, 60, 66), and learning related addition and subtraction facts together (16) have been found to be superior to learning through drill on isolated facts. Children learn to use the subtractive decomposition[1] method meaningfully when they understand the decimal structure of the number system. (5, 36) In a classroom experiment Madden found that children who were taught the function of zero as a place-holder quickly overcame long-standing errors in multiplication containing one or two zeros. (36) Wheat reports a study in which understanding of the underlying principles involved in measurement made it unnecessary for children to memorize tables of measure. (66)

Children do not learn through memorizaton alone, even when a definite effort is made to teach by repetitive drill. (61) In spite of the drill they work by some procedure that is meaningful to them. For instance, a child will count to get an answer to a combination or work from a known fact. Brownell has shown that drill can increase a child's speed and accuracy, but only in the procedure which he already understands and is using. If he is counting, he continues to count but with increasing speed. If he is getting an answer by working from another known fact he continues to do so, but more rapidly. (11)

Will the planning of practice situations which provide for understanding and which stimulate more mature ways of thought obviate the need for reteach-

[1] In the example 42-27, 7 ones cannot be taken from 2 ones. Take one of the 4 tens and add 10 ones, to the 2 ones. 7 from 12 leaves 5. Since one of the 4 tens was used, 3 tens remain. 2 tens from 3 tens leaves 1 ten.

ing? Will practice of this nature help children use arithmetic more effectively in their everyday living? Research indicates an affirmative answer.

Rich Experiences Are Important in Developing Problem-solving Ability

Many factors enter into the difficulties which children encounter in problem solving. One of these is, of course, general maturity. (40, 56) Another is inability to understand textbook problems because of unfamiliarity with the situation described or with the vocabulary. (24, 26, 28, 32, 39, 40, 45, 52, 55, 56) A third factor is failure to understand basic quantitative relations. (8) Lack of skill in the fundamental operations of arithmetic also causes trouble. (40, 45, 56)

There is no substitute for rich, meaningful experiences in developing problem solving ability. (25, 63, 64) Problems involving quantitative relations arise every day in a classroom with a varied program of activities. Children are constantly meeting quantitative problems in their lives outside of school. These problems mean much more to them than do the problems in books.

If a child is to solve a problem he must orient himself to its conditions—he must see its essential aspects and keep them in mind. (27) Too often what a child "sees" in a textbook problem is whether to get an answer to it and please the teacher or whether to continue with an activity which is more significant to him. Frequently when he chooses the first alternative he says, "Shall I add or subtract? Tell me what to do and I'll do it for you." Drawing problems from children's actual experiences, problems which they feel a need to solve, helps them in orienting to problem situations. Use of introductory materials which give a problem meaning and significance is important when textbook problems are used.

If a problem is too difficult a child often gives up trying to orient to it and daydreams or looks for some easier quasi-solution. (27) Careful analysis of the vocabulary and structure of language in which problems are stated is important if children are not to turn to substitute activities. Encouraging children to tell the way in which they think about a problem, encouraging them to use concrete materials and to make simple diagrammatic pictures (18) helps them in orienting to problem situations.

After a child has oriented to a problem he must produce relevant materials of thought if he is to reach a solution. He may secure these materials from the immediate situation, from memory or by communication with other people. He must set up a plan of action which fits the requirements of the solution. This plan determines which materials of thought will be available for his use. If a routine pattern is set up it may be pursued mechanically into failure. (27) Encouraging children to use a creative as contrasted to a routine method of attack is highly important in helping them develop ability in problem solving.

Even this brief survey of research studies indicates that we too must be creative as we attack the problem of teaching arithmetic effectively. We know that children need security. They need stimulating intellectual experiences. Arithmetic can be routine and dull. It can be confusing and frustrating to children. Continued study of research in child development and in arithmetic can help us make it an exciting adventure in the discovery and use of ideas. The following bibliography will be helpful.

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We Must First Look at the Child

(Continued from page 246)

is a mighty yet a promising one. Such a program calls for a teacher who is ready to look at the child and his world in order to find out how she can best help him, rather than at traditional courses of study and/or college notes. She must have some ability to look around her and see the many possibilities for using everyday things in her teaching: to know how to select and when to develop certain ideas which present themselves. She must of necessity keep up-to-date in arithmetical values, and in the changing language of our day. This is the challenging side of the picture. The promising side is important, too, and the teacher who understands how to keep studying her children finds that she is constantly learning much that is of value, not for arithmetic alone, but for all the curriculum.

By RUTH STRANG

Developing Guidance Services for Rural Children and Youth

This article is a synthesis of the discussions at the institute sponsored by the Alliance for Guidance of Rural Youth November 7, 1949, at the headquarters of the N.E.A.

Four approaches to rural guidance were described by persons closely associated with these programs in widely different rural communities. The common feature was cooperative growth which grew out of local needs and was developed by local people, using the resources in the local community and such supplementary help as they could obtain from state and national agencies.

Meeting-basic-needs approach. A type of program that might be so characterized was presented by Harold A. Smith, supervisor of guidance services for the South Carolina State Department of Education. In the rural farming community of Green Sea, South Carolina, local people became concerned about the lack of guidance of all the children and young people in the community. They recognized that certain conditions were making effective guidance impossible. Children were dropping out of school beginning with the first grade: a very small percentage completed high school. Obviously, school counselors, if they were available (and they were not), and teachers could not guide pupils who were not in school.

Health conditions were also defeating any guidance that might be attempted. The curriculum and methods of instruction were not providing the experiences individual children needed. The rate of teacher turn-over was great and often the qualifications of teachers were sub-standard. These were basic conditions that must be changed in order to attain the goal of guidance—the discovery and development of the potentialities of every individual. Accordingly, Green Sea began work on these problems with help from the supervisors of the state department of education and the Alliance for Guidance of Rural Youth.

The people of the high school district of Green Sea—a farming area of 56 square miles served by one high school and eleven elementary schools—have organized a community planning council which meets regularly once a month to discuss problems, achievements, and next steps. In-service teacher education institutes are planned through the year with consultants from the state department of education to work with elementary teachers on methods of studying children having a reading disability, and ways of adapting the curriculum to provide experiences indicated by these special studies. Similarly, high school teachers are studying individual boys and girls who are potential drop-outs: a health committee has made a community-wide immunization and sanitation survey to obtain information for demonstrating the need for allocating public funds for a health center in Green Sea; a veterans committee has built a community recreation center; special committees are giving attention as to how the land resources in Green Sea can be used more efficiently—how production can be increased, how woodland can be made to yield a larger income, and how the recreational aspects of the community can be capitalized.

A similar approach in a rural community of Wisconsin was described by Shirley Cooper of the American Association of School Administrators. A follow-up study initiated there by the high school principal showed that a large number of farm boys and girls wanted to remain on the land but could find no employment. So the local people brought an industry to the community—a shoe factory that gave employment to 250 persons and that adjusted its production so that the workers would be free for farming at seasons when planting and harvesting had to be done.

Child-study approach. This form of in-service education of teachers was described by John Greene, supervisor, Union Parish Public Schools, Louisiana, who working closely with Daniel A. Prescott, director of the child study institute of the University of Maryland, has developed vital child study groups. In this school system 110 of the 135 teachers are voluntarily participating in these study groups and learning to understand children as a basis for guidance.

Similarly, T. H. Owen Knight, supervisor, pupil personnel, Montgomery County, Maryland, who also works with the child study institute, is replacing the old-type attendance officer for the county and is spending half of his time with parent study groups. This program recognizes that a large part of child guidance is parent guidance, and there is a balanced and coordinated program of in-service teacher and parent education child study groups at work throughout the county.

Day-to-day-in-service education-of-teachers approach. This type of program was described by Glyn Morris, principal of Evarts High School in a rural-industrial community of Harlan County, Kentucky. The quality of guidance in the high school is being improved by means of a county-wide institute held after the beginning of school each autumn; by means of faculty discussions at the noon hour, voluntary child study groups, and groups formed to study special problems such as the use of homeroom time for guidance; by means of reading clinics, radio broadcasts, demonstrations, youth panels and round tables, and other methods. This program has been developing over several years with assistance from the Alliance for Guidance of Rural Youth.

Guidance-specialist-approach. To illustrate this type the Rockland County, New York, program was described by Leonard M. Miller, specialist for counseling, pupil personnel and work programs, U. S. Office of Education. The trained counselor, school clinical worker, teachers, administrators, and youth-serving community agencies work cooperatively in this program. Many curriculum revisions have been made during the past fifteen years to meet individual student and community occupational needs which have been determined by follow-up studies of pupils and by community surveys. Instead of building specialized vocational high schools, terminal vocational courses were established in selected high schools throughout the county and were made accessible to any young person in the county by means of a shuttle bus service.

The Rural Teacher —Key to Guidance Service

The rural teacher as the key person in assuming responsibility for individual guidance in the rural school was emphasized in both the general sessions and the small group meetings of the institute. Everyone recognized that, desirable as it would be to have the daily services of the guidance specialist, such persons are not now available to the thousands of communities in the country such as Green Sea, Harlan County, and Union Parish—the types of communities in which a majority of the young people are growing up today. Such communities can however organize as these have done to correct conditions that defeat guidance; can call upon state and national organizations and agencies for help in planning in-service education of teacher programs; and can move toward having the services of persons with special guidance training as visiting teachers, county supervisors, principals and teachers so that boys and girls in rural communities today need not lack guidance.

The accounts of these varied types of guidance work actually being carried on were heartening. Their value to the children and young people in other states depends upon the leaders' skill in extracting guiding principles from these "grass roots" demontrations and in adapting procedures to their own situations. As Daniel Prescott who presided during the general sessions of the institute emphasized, there is always a key person in each of these situations, and the secret of success lies largely in the subtle aspects of interpersonal relations.

News and REVIEWS . . .

News HERE and THERE . .

By MARY E. LEEPER

New ACE Branches

Pueblo Association for Childhood Education, Colorado
Hopkins County Association for Childhood Education, Kentucky
Owensboro Association for Childhood Education, Kentucky
Calcasieu Parish Association for Childhood Education, Louisiana
Southern Oakland County Association for Childhood Education, Michigan
Pierre Association for Childhood Education, South Dakota

Another ACEI Publication

More and Better Schools for Children Under Six is the title of a new ACEI portfolio. This replaces one that has been out of print for some time—a portfolio on kindergarten extension.

The material is designed to be of use to educators and other citizens who are seriously concerned with extending the opportunities for children under six and improving those programs now being offered to young children.

The twelve four-page leaflets included are on these topics: Children Need Group Experience, Getting and Keeping Schools for Young Children, Nursery School and Kindergarten Facilities, A Day in School, What Makes a Good School, So You Are Looking for a Teacher, Listen to Others on the Values of Early Childhood Education, Know Your Resources, Use Legislation for Children, Facts and Figures—Questions People Ask, Schools for Children Under Six—How They Have Been Growing.

The portfolio was compiled and edited by Elizabeth Neterer, principal, Hawthorne School, Seattle, Washington. Copies may be secured from the Association for Childhood Education International, 1200 Fifteenth Street, N.W., Washington 5, D. C. Price, seventy-five cents.

Associate Commissioner of Education

Bess Goodykoontz is the recently appointed Associate Commissioner in the Office of Education. Oscar R. Ewing, administrator of the Federal Security Agency, in announcing Miss Goodykoontz's appointment says:

> At this time when the abilities of women are receiving increasing recognition in public life, it is particularly appropriate that this promotion comes to one of the outstanding women in American education.

U. S. Commissioner of Education Earl James McGrath commented as follows:

> I look forward to working with Miss Goodykoontz in her new position as Associate Commissioner. Her long and varied experience in the Office of Education will, I am sure, prove of great value to American education.

In her new staff capacity, Miss Goodykoontz will have the responsibility, with other professional duties, for general oversight of Office of Education conferences, field surveys, and liaison with the Citizens Federal Committee and with national meetings of lay groups and professional organizations concerned with education.

Brotherhood Week

Brotherhood Week is observed during the week of George Washington's birthday. The date in 1950 is February 19 to 26. This special week, sponsored by the National Conference of Christians and Jews, is a period of rededication to the principles enunciated in the Preamble to the Declaration of Independence. It has not been set aside as the one week of the year most suited to the practice of brotherhood—all weeks are equally in need of that practice. It is, rather, a time of resolution and renewal, when from a thousand sources the American people draw the inspiration necessary to sustain brotherhood throughout the year. These words from Stephen Vincent Benet are significant:

> Grant us brotherhood, not only for this day but for all our years—a brotherhood not of words but of acts and deeds. We are all of us children of earth—grant us that simple knowledge. If our brothers

are oppressed, then we are oppressed. If they hunger, we hunger. If their freedom is taken away our freedom is not secure.

When Children Leave School

The National Child Labor Commission has just completed and published a study, under the direction of Harold J. Dillon, on the reasons why young people voluntarily withdraw from school. First-hand information was sought as to causes of school leaving, and the warning signs of vulnerability to school leaving, as a basis for determining what measures the schools might take to increase their holding power. The committee made a detailed study of a representative sampling of the young people in five communities, totaling one thousand, three hundred sixty individuals, who had withdrawn voluntarily from school the previous year.

Findings are based on three sources of information—(1) all available facts from the school records of the young people studied; (2) a personal interview with each one to obtain, so far as possible, the real reasons which motivated him to leave school, his evaluation of his school experience and his subsequent work history, and (3) appraisal of his characteristics by two or three teachers who knew him before he left school.

What the school records showed about vulnerability to school leaving, according to the report, is that potential school leavers are characterized by regression in attendance and in scholarship as they advance in school, that the majority are grade repeaters, beginning in the elementary school in 70% of the cases, that they have frequent transfers (two-thirds had three or more transfers exclusive of normal progress transfers and that not more than one-quarter participate in extracurricular activities.

Most of the school leavers make their decisions to leave school and find their jobs without consulting anybody in school. Frequent comments were that "nobody in school was interested in them" and they had "nobody to turn to for advice or help." "From this it seems clear," says the report, "that the majority of school leavers go ahead on their own in taking this important step and that they do not think of the teacher or counselor as someone to turn to for help in making decisions. The fact that youth does not see the importance of discussing their problems with someone attached to the school staff before withdrawal from school is tragic and costly for them and for society. Another unfortunate fact is that teachers and counselors are frequently so overburdened with other and less important tasks that their knowledge of the individual student is too limited to enable them to give him any real help if he asked for it."

The chief emphasis throughout the recommendations with which the report concludes is on "the need for better knowledge and understanding of individual children, since the evidence pointed to this as the basic problem in school leaving. While it will take time and planning to meet the needs of each individual student in our school systems, every school, with a little extra effort, can initiate some changes in the present program to serve a greater number of youth more adequately than it is now doing. Educational programs of the right kind, adequately supported, are the most economical and effective measures that can be taken to conserve our human resources."

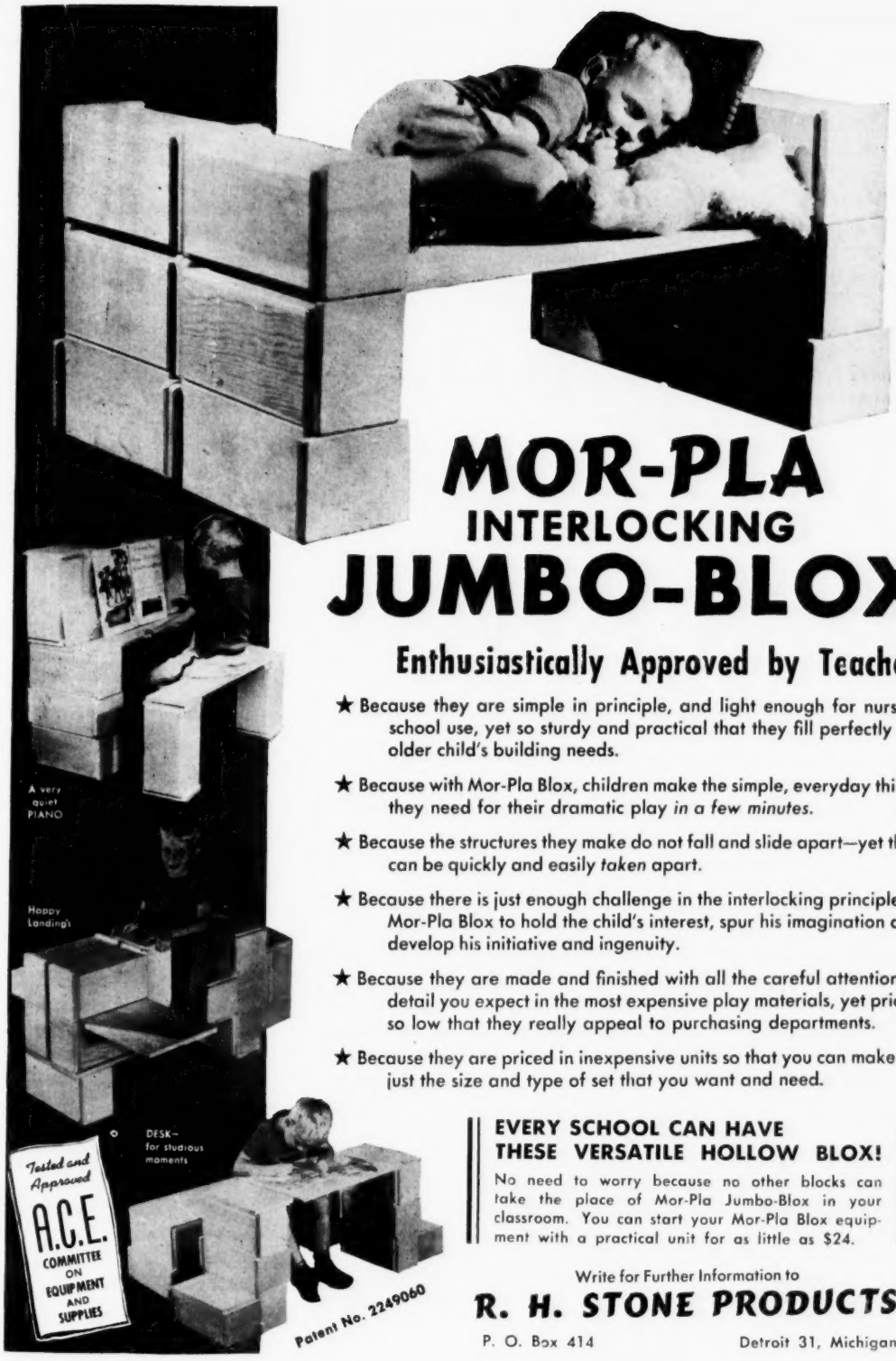
Schoolmates Overseas

"Schoolmates Overseas" is to be the name of a service project around which more than a million U. S. Girl Scouts will build a great part of their international friendship program during 1950.

Troops all over the United States will get under way early in January with the work of making sturdy schoolbags and filling them with paper, pencils, and other needed supplies which will make school days easier and happier for youngsters in foreign lands. Also included in the schoolbags will be small knitted articles such as mittens or caps, and a toy, game, or trinket to make it clear that these are friendly gifts from children to children. The first large collection of schoolbags for shipment abroad will be made on the Girl Scout Birthday, March 12.

WOTP 1950 Assembly

Ottawa, Canada, will be host next summer to the fourth delegate assembly of the World Organization of the Teaching Profession. On the agenda for the session will be a discussion of the ways teachers may secure the support, understanding, and cooperation of the public in the educational process. The meeting will be held July 17-22, 1950.



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Bulletins and Pamphlets

Editor, CELIA BURNS STENDLER

For Parents and Teachers

FOR PARENTS PARTICULARLY. *Reprint Service Bulletin compiled from past issues of* CHILDHOOD EDUCATION *by the Association for Childhood Education International. 1200 Fifteenth Street, N.W., Washington 5, D.C.: the Association, 1949. Pp. 40. 50c.* A collection of articles which are of equal interest to parents and teachers, designed to help in furthering understanding of children, in planning experiences for them both in school and out, in preparing children for entrance to public school, and in improving parent-teacher conferences. Teachers will benefit from this opportunity to read articles they may have missed, and will find the pamphlet a valuable one to recommend to parents.

PREPARING YOUR CHILD FOR SCHOOL. *By Hazel F. Gabbard. Pamphlet No. 108, Federal Security Agency, Office of Education. Washington 25, D.C.: Superintendent of Documents, U. S. Government Printing Office, 1949. Pp. 23. 15c.* This publication does what so many bulletins beamed at parents of entering school-age children attempt to do, only this one succeeds. What it does is to put preparation for school in the whole context of child growth and development. Getting Johnny ready for school is not seen as a series of exercises, but rather Johnny is ready for school as a result of the kinds of relationships existing in the family, and the kinds of experiences in family living Johnny has had prior to school. Specific suggestions for meeting the school staff and getting acquainted with the school building are included.

KNOWING AND GROWING. *Edited by Walter D. Johnson. Prepared by the teachers of the Las Vegas Kindergartens, Southern Nevada Association for Childhood Education. Las Vegas, Nevada: Board of Education of the Las Vegas Union School District, 1949. Pp. 27. No price given.*

SCHOOL DAYS AHEAD. *Prepared by the kindergarten teachers and L. Katherine Clarke. 3160 Easton Ave., Clayton, Missouri: Missouri Printing and Engraving Company, 1949. Pp. 20. No price given.* *Knowing and Growing* and *School Days Ahead* are attractive kindergarten handbooks done with many photographic illustrations. While much of the information for parents is good, it is unfortunate that the child development approach found in Miss Gabbard's pamphlet is lacking. All too many handbooks, instead of emphasizing a nice, easy, relaxed transition to school, give the impression of a rather rigid system to which the child is to adjust rather than vice versa. Dropping nicknames as a preparation for school and leaving a child at the door on the first day, regardless of crying, belong to the heartless era of the '30's rather than the present day with its emphasis on good emotional health.

YOUR CHILD STARTS TO SCHOOL IN LOUISVILLE. *1949-1950. Prepared by the teachers of kindergarten and first grade under the direction of Mary Browning. Louisville, Kentucky: Public Schools. Pp. 30. No price given.* This pamphlet is an interpretation of kindergarten and first grade school practices for parents. Profusely illustrated with photographs of children at work and play, the handbook explains in simple language such concepts as individual differences in beginning reading, how reading is taught in Louisville schools, the place of phonics, how skills are taught functionally in an experience curriculum. A helpful list of community agencies available to parents in Louisville is included.

While some readers may disagree with certain details in teaching methods, teachers and school administrators who are preparing materials for parents will find that this pamphlet contains more detailed explanations for parents than any other similar publications.

YOUR CHILD'S SPEECH AND HOW TO IMPROVE IT. *By Amy Bishop Chapin and Ruth Lundin. Cleveland, Ohio: the Press of Western Reserve University, 1949. Pp. 30. 75c.* This is a pamphlet designed to help parents and classroom teachers working with children who have defective speech. The

program begins with a picture-word test in which the child is tested, through a story, on different sounds. Following the test, the mother or teacher selects a sound and has the child practice it, using word lists, poems, and games included in the pamphlet. The authors do not see speech defects as rooted in personality structure and as closely related to family relationships as do an increasing number of speech therapists today. However, for parents and teachers who through other means have developed insight into the emotional etiology of speech defects, this pamphlet will serve as helpful resource material.

Among the MAGAZINES

Editor, LOUISE RAIRDEN

READER'S DIGEST. *December 1949. Pp. 64-67. "Better Toys for Your Child." By Laird S. Goldsborough.* The author offers sound advice to parents interested in procuring suitable toys for children from infancy to ten years of age. Some of his suggestions are excellent, but a few are poor. Exercisers for infants, tractors, fancy doll houses, electrical kitchen equipment, and dummy figures (for release of anger) would not be considered appropriate toys by most child psychologists. They would concur, however, in his approval of dolls for young boys and in his disapproval of mechanical toys for all children.

The author believes that toys made from raw materials around the home are the ideal ones. Adequate space in which to play, parental encouragement and supervision are more important than expensive equipment and material. He wisely cautions parents to distribute their purchases throughout the year rather than to over-buy at Christmas time.—*Reviewed by* RUTH HOWE, *teacher, Evanston School, Cincinnati.*

COUNTRY GENTLEMEN. *December 1949. Pp. 108, 130. "Christmas is a Birthday." By Betty Kramer Duncan.* You are bothered when Joe asks about Santa Claus? So did three-year-old Martha ask questions. Her parents did not want to lie and they made a most sensible practical approach for their daughter. Now Martha has the truth *and* her Santa Claus. "Let's pretend," and off they go with all the joys of Santa and his reindeer. To quote her mother, "Such a natural, easy explanation—why were we in such a dither!"

Besides the fun of the legends and the security of her parents' honest answers to her questions, Martha has still more—the true meaning of Christmas interpreted for her. To her, Jesus becomes a very real person and a beginning spark of love for Him is kindled and grows as she learns of His love for her.—*Reviewed by* ZELMA CAMPBELL, *teacher first grade, Guilford School, Cincinnati.*

LADIES' HOME JOURNAL. *December 1949. Pp. 11-12. "Road Accidents Can Be Cut Down." By Dorothy Thompson.* Between 1914 and 1945 more people were killed and injured in traffic accidents than in the two World Wars. Statistics also show that the casualty rate is highest among young drivers. These facts make it not only advisable but urgent that the youth of our nation be educated for safer driving.

Suspending licenses, confiscating autos, and levying fines are not as likely to reduce the number of accidents as training youth for careful driving. Records reveal that accidents among instructed young drivers are fifty percent fewer than among the uninstructed.

The American Automobile Association started a movement with local boards of education some five or six years ago to include driver training in the high school curriculum. The AAA prepared textbooks and recommended a course of five periods weekly for nineteen weeks under the supervision of good teachers. Simple mechanics of the car and rules of safety were to be taught both by theory and by practice.

Of the 26,000 high schools in the United States less than one-third have introduced driver instruction. It is likely to become a part of the curriculum of every high school when parents see the need and insist upon it. —*Reviewed by* BEULAH WEST, *teacher, third grade, North Fairmount School, Cincinnati.*

LOOK. *November 8, 1949. Pp. 16, 18, 20. "Grade School Wins Its 'T' for Teeth." By the Staff.* "I want to go to the dentist!" "When may I go to the dentist?" Believe it or not, pupils in a public school in New York City—P. S. 116—evidently make such pleas, for that school has achieved a one hundred percent record for perfect teeth for five consecutive years.

Look was so impressed with the enviable record that it thought the school should be given publicity. A series of pictures and an article show how the school and the Community Service Society have taught the children to feel not only that they *should* take care of their teeth, but also that they *want* to take care of them. Having been given an understanding of what the dentist will do, going to the dentist becomes an interesting experience rather than one to be feared.—*Reviewed by* FRANCES STOELTING, *teacher, first grade, Condon School, Cincinnati.*

Films Seen and Liked . .

Reviewer, ALBERTA MEYER

INTRODUCTION TO FRACTIONS. *Produced by Johnson Hunt Productions, 1133 N. Highland Ave., Hollywood, California, 1947. 11 min. Sound. $45, color $85.* "I wish I had seen this before I ever learned anything about fractions," said one bright-eyed sixth grader, whose classmates were seeing this film to help them review what they had studied last year.

Introduction to Fractions is just what its name implies. By showing the division of delicious-looking cakes, pies, candy bars, and ice cream, the film explains the meaning of the word "fraction", introduces and explains the terms "numerator" and "denominator", shows how fractions of like denominators may be added, and gives adequate treatment to improper and mixed numbers. The use of animated diagrams helps to clear many concepts which are frequently lost in the mere manipulation of numbers. Designed for intermediate grades but equally useful for review purposes in upper grades.

HOW TO SUBTRACT FRACTIONS. *Produced by Johnson Hunt Productions, 1947. 11 min. Sound. $45, color $85.* Another film in the fraction series by the same producer. *How to Subtract Fractions* uses the same techniques as it develops the concept "subtract", explains why denominators of both fractions must be the same before one can subtract, and shows how to change a fraction to its equivalent with a larger denominator. The frequently confusing process of "borrowing" when subtracting a fraction from a whole number is made clear by animated diagrams. Designed for intermediate grades but equally useful for review purposes in upper grades.

FINGER PAINTING. *Produced by International Film Bureau, 6 N. Michigan Ave., Chicago, 1948. One of "Creative Hands" series. Color, $50. Five min.* A man's hand moving with force and precision as he works out a colorful finger-painting is the dramatic introduction to this film. The gentleman then appears and shows how to make finger paint. Several suggestions for protecting clothes and work surfaces are given as three eleven- or twelve-year-olds are introduced. The first boy is a beginner and the film shows him experimenting and studying the effects obtainable by using the palm, the side of the hand, the fist, the thumb, the finger tips. A girl with much experience in the medium paints a lovely design with several colors. Another boy wishes to use his painting for a book jacket, so he paints an all-over pattern with much repetition. He also demonstrates the use of a bit of flat wood or a small piece of crunched newspaper to make designs.

This film would most certainly stimulate in both children and adults the desire to experiment in this responsive medium. Techniques are demonstrated but the emphasis is on freedom and originality.

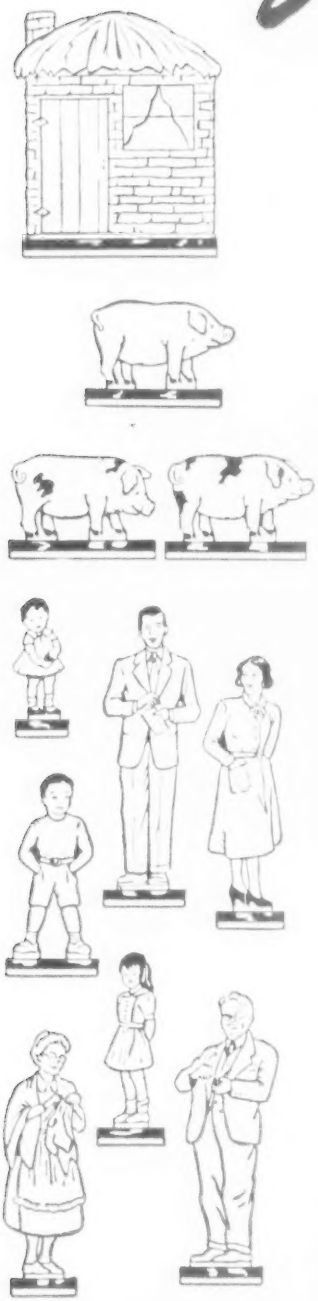
PAPER SCULPTURE. *Produced by International Film Bureau, Inc., 1948. One of "Creative Hands" series. Color, $50. Five min.* In brilliant color this film indicates some of the possibilities of paper sculpture as a creative art form. Middle grade children are shown at work, and their products are shown at various stages as well as finished favors, masks, posters, and table displays. Although emphasis is put on simplicity and originality, the film gives concrete suggestions in techniques such as folding, rolling, curling, pleating and cutting out paper to achieve the desired result. It is the kind of film that makes its audience eager to try out the technique for itself.

HOW TO USE THE LIBRARY. *Produced by Coronet, 207 E. 37th St., New York, 1946. One reel sound film. Black and white, $45; color $90.* How to use a card catalogue to find the call numbers of books on a certain subject, how to locate these books on the shelf, how to choose the most helpful books, how to find topics in an encyclopedia, how to use the *Readers' Guide to Periodical Literature* and the vertical file are all shown in this film. The librarian is pictured as a friendly, helpful person to whom the student may freely turn. The film assumes that its audience knows how to use an index and how to read decimals. It is best suited to junior and senior high school.

Editor's Note: All films reviewed here are 16 mm.

TEACHER EDUCATION SCHOOLS

Judy Story Toys



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